PLANT BREEDING ABSTRACTS

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PLANT BREEDING ABSTRACTS

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Plant Breeding Abstracts

Vol. XXX, No. 1

STATISTICS

1 FINNEY, D. J.
The efficiencies of alternative estimators for an asymptotic regression equation.
Biometrika 1958 : **45** : 370–88.

Methods for estimating the parameter ρ in the equation $y = \alpha - \beta\rho^x$, given pairs (x,y) of observations subject to error, are discussed. Detailed investigation is only included for four observations equally spaced in x, but two types of error, independent and autoregressive, are considered. The principal recommendation is that the Patterson estimate is a fairly safe one to use and reasonably easy to compute.

2 PATTERSON, H. D.
The use of autoregression in fitting an exponential curve.
Biometrika 1958 : **45** : 389–400.

A method of estimating ρ in the equation $y_x = \alpha - \beta\rho^x$ using the regression of y_{x+1} on y_x is discussed. The efficiency has been shown to be high when x takes only four values [cf. 1]*; the present author shows that the efficiency decreases markedly with n.

3 BECHHOFER, R. E.
A sequential multiple-decision procedure for selecting the best one of several normal populations with a common unknown variance, and its use with various experimental designs.
Biometrics 1958 : **14** : 408–29.

Let δ be the difference between the largest population mean and the second largest, and let δ^* be the smallest such value that it is worth detecting. Let P be an assigned probability. At each stage of the process one observation is taken from each of the populations and a statistic calculated. If the statistic is sufficiently large the population with the largest sample mean is selected, otherwise the experimenter goes on to the next stage. The procedure ensures that the probability of selecting the best population, i.e. with the largest mean, is at least P whenever $\delta \geqslant \delta^*$. A numerical example for a completely randomized design is included, and the details of the procedure with randomized blocks, cross-over designs and Latin squares given. Approximate methods are also described.

4 COX, C. P.
The analysis of latin square designs with individual curvatures in one direction.
J. R. statist. Soc. : Ser. B 1958 : **20** : 193–204.

The author considers the analysis of a Latin square, not in the usual way by removing row and column effects, but assuming polynomial trends in the individual columns. He shows how to estimate the treatment effects, allowing for the trends, and their standard errors. These latter will not be the same for all treatments but will be approximately equal for certain squares. The adequacy of the model and the order of the polynomial are discussed. Numerical examples on the milk yield of cows are included. This analysis might provide better estimates of the treatment effects in situations where the row and column effects are not additive.

5 WILKINSON, G. N.
The analysis of variance and derivation of standard errors for incomplete data.
Biometrics 1958 : **14** : 360–84.

This is a continuation of an earlier paper by the same author [XXIX, 19] and deals with the general theory of the effect of missing values on the analysis of variance and on the standard errors of treatment effects for designs with two-way restriction. A numerical example of a 6 x 6 Latin square with 4 missing values, and the algebraic details of a balanced incomplete block design with one or more missing blocks, but with no more than one replicate of any treatment missing, are given.

6 COX, C. P.
Experiments with two treatments per experimental unit in the presence of an individual covariate.
Biometrics 1958 : **14** : 499–512.

Experiments are considered in which each experimental unit is observed at equally spaced intervals over a period of time. During the first part of the period one treatment is applied to a unit, and during the second part another treatment is applied. Estimates of the treatment effects and the interaction with individuals are given, allowing for polynomial trends in time. An example on dietary effects on the hatchability of fowls' eggs is included.

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* References in square brackets are to volume and number of entry in *Plant Breeding Abstracts*.

7 Elandt, R.
O stosowaniu analizy wariancji. I. Uwagi metodyczne. **(On the use of analysis of variance. I. Methodological observations).**
Roczn. Nauk rol. : Ser. A. 1958 : **78** : 697–717.

Analysis of variance is outlined with special reference to the assumptions upon which the F test is based. Methods for the transformation of the variate when the assumptions are not satisfied and for the calculation of analysis of variance in the case of missing observations are also discussed.

8 Caliński, T.
O zastosowaniu kontrastów ortogonalnych do badania interakcji. **(On the application of orthogonal contrasts for investigating interaction).**
Roczn. Nauk rol. : Ser. A 1958 : **79** : 635–75.

It is shown that composite contrasts can be applied to interaction investigations in the analysis of variance of the results of factorial experiments. A theorem is proved on the basis of which it is possible to subdivide the sum of squares for two-factor interaction into independent components, corresponding to particular elements of the interaction defined by composite contrasts. Examples of the use of the theorem are given.

9 Dagnelie, P.
Le carré latin magique: technique d'analyse de la variance. **(The magic Latin square: the technique of variance analysis).**
Rev. Agric., Brux. 1959 : **12** : 233–42.

The construction of magic Latin squares and a corresponding method of analysis of variance are explained.

10 Scossiroli, R. E. & Wittmer, G.
Applicazioni della statistica in agricoltura. IV. Analisi della varianza con interazione. **(Applications of statistics in agriculture. IV. Analysis of variance with interaction).**
Tabacco, Roma 1959 : **63** : No. 690 : 46–55.

Analysis of variance of the yield of six tobacco varieties grown at two locations is demonstrated [cf. XXIX, 35].

11 Gomes, F. P. & Guimaraes, R. F.
Joint analysis of experiments in complete randomized blocks with some common treatments.
Biometrics 1958 : **14** : 521–26.

In the situation of the title, treatments either occur in all experiments (common treatments) or in only one experiment (regular treatments). The analysis of variance and estimates of treatment effects are obtained, and illustrated by an experiment on *Eucalyptus*.

GENETICS

12 Tanaka, Y.
Report of the International Committee on Genetic Symbols and Nomenclature.
Wheat Inform. Serv. Kyoto 1959 : No. 8 : 24–27.

The rules for genetic symbolization officially adopted at the tenth International Congress of Genetics, held at Montreal in 1958, are given, together with a short account of the work entailed in drafting the rules and the prefatory comments of the committee on the application of the rules.

13 Pirovano, A.
Mendel nel centenario della sua scoperta. **(Mendel in the centenary of his discovery).**
Riv. Ortoflorofruttic. ital. 1959 : **43** : 276–81.

The F_2 from Mendel's crosses, made in 1857, was studied by him in 1859 and this year is taken as the crucial one for his discovery, the significance of which is outlined. The author goes on to describe a visit he made to the Institute of Genetics in Moscow, where he explained to Lysenko and his followers that the cases claimed by Mičurin as exceptions to Mendelian principles resulted from heterozygosity in the parents, some of which were even triploids.

Proceedings of the Genetics Society of Canada 1958 : 3 : No. 2 : 1–56.

14 *Ledingham, G. F. Chromosome numbers in* Astragalus. (*pp.15–18*).

Examination of additional material has confirmed the earlier finding that North American species of *Astragalus* have predominantly $n = 11$ or 12 and Old World species mainly $n = 8$ [cf. XXVIII, 1789]. Plants ancestral to *Astragalus* may have occupied a southern continent during the Mesozoic era. With migration northwards into separate land masses, the cytological differentiation now apparent between North American and Old World species may have become established. North American species having $n = 8$ are probably Old World species which migrated into North America from Siberia during the Pleistocene period. The separation of *Astragalus* into two groups is supported by a consideration of the chromosome number ($n = 8$ or a multiple of 8), circumboreal distribution and certain morphological features of species of *Oxytropis*, the genus most closely related to *Astragalus*. The cytological findings are also discussed in relation to the taxonomy of *Astragalus*. In conclusion, it is emphasized that the author's tentative conclusions are based on an examination of only about 10% of the species of the genus.

15 *Löve, A. & Löve, D. An unusual polyploid series in* Triglochin maritimum *agg.* (*pp. 19–21*).

Seven out of twelve possible numbers in a polyploid series ranging from the diploid ($2n = 12$) to the 24-ploid level have been discovered in the *T. maritimum* complex, as the result of examinations by the authors and other investigators.

16 *Weijer, J. Some genetical evidence for the complexity of the td locus of* Neurospora crassa. (*pp. 22–29*).

A detailed report is given of investigations of which the results have already been summarized [XXIX, 1130].

17 *Kaufmann, M. L. Seed size as a problem in genetic studies of barley.* (*pp. 30–32*).

Using large, medium and small classes of kernels within each of the varieties and selections tested, observations were recorded on root development and top growth of the seedlings and on tiller production. The results indicated that seed size has a marked influence on plant development. Consequently, if heritability studies based on features associated with vigour and yield are to be successful, seed size should be taken into account. Selection of seed of uniform size is also essential if selection for high yield or early maturity on a single-plant basis is to be effective.

18 *Kuspira, J. Chromosome substitution lines.* (*pp. 33–36*).

The author gives (1) an account of methods used at the Department of Plant Science, University of Alberta, to produce substitution lines of wheat and in making genetical analyses by means of such lines, and (2) a summary of data on the effects of substitution on yield and earliness in lines in which each of the chromosome pairs of Chinese Spring has been replaced by a homologous pair from Thatcher [cf. XXVII, 399 and XXVIII, 263].

19 *Wakonig, R. & Arnason, T. J. Some effects of the chelating agent E.D.T.A. on plant chromosomes.* (*pp. 37–40*).

Using roots of *Vicia faba* and barley, ethylenediaminetetraacetic acid (EDTA) was found ineffective as an agent causing chromosome breakage. Seedling chlorophyll mutations did not appear in small test populations derived from ears of plants raised from barley grains treated with the chemical.

20 *Walker, G. W. R., Kasha, K. & Miller, R. A. Recombination studies in barley.* (*pp. 41–43*).

Information is provided on characters being used in linkage studies at the Department of Plant Science, University of Alberta. By means of a series of recombining crosses, it is hoped ultimately to obtain two lines, oppositely allelic for as many as 50 oligogenes, each of which produces a conspicuous phenotype and shows little interaction. The report includes data on linkages of mutant genes described as follows: mottle 1; bushy head; multiflorous; mid-season broad stripe; *bracteatum*; viable yellow; dense head; crooked neck 1 to 4; non-glaucous sheath; third inner glume; sterile misshapen heads; variegated 1; curly laterals; variegated 2; leafy bract (dominant); mottled 2; broad leaf; *densinodosum*; and glossy foliage. Characters receiving comprehensive study include: male-sterile dwarf, absent lower laterals, crooked neck 5, mottled 3 and yellow-green stripe. The first four are respectively linked with *v*, *br* (possibly), *k* and *fc* (possibly). [cf. XXIX, 1126].

21 *Lesins, K. & Lesins, I. Some improvements in paper chromatography technique for sap-soluble plant pigments.* (*pp. 44–46*).

Use of a new irrigation solvent (5% aqueous orthophosphoric acid solution) and circular filter papers has been found to meet the requirement of a rapid and distinct separation of sap-soluble pigments for genetic analysis. Only a period of 4–6 hr. is required to make a chromatogram by these means.

22 *Cram, W. H. Two recessive characters of* Caragana arborescens. (*pp. 47–49*).

The "*pendula*" or drooping habit of growth of selection N19 is due to recessive mutation (*p*) of the gene for normal erect growth. Attention is drawn to the value of N19 as a *pp* tester for determining the genotype of self-incompatible selections with respect to habit. In breeding having as its objective the mass production of hybrid seed from self-incompatible selections, the *pendula* character is undesirable. In addition, N19 proved to be heterozygous for a recessive gene (*a*) causing yellow chlorophyll-deficient lethal seedlings.

23 *Person, C. Further studies on chromosome movement.* (*p. 49*). (*Abst.*).

Study of meiosis in a truly asynaptic barley plant confirmed earlier conclusions that (1) deviations from random in univalent distribution occur as a result of disjunctional separation of quasibivalents and (2) quasibivalents are formed when prophase pairing is followed by failure of crossing-over in paired homologous chromosome segments. An attempt to determine if secondary pairing of bivalents also occurs as a result of similar processes led to a reanalysis of chromosome behaviour in *Ornithogalum.* No support was obtained for Thermann's claim that somatic and secondary pairing are characteristic of this genus.

24 *Smith, W. E. Fertility studies in autotetraploid barley varieties and their hybrids.* (*pp. 49–50*). (*Abst.*).

Most of the autotetraploids were induced by soaking germinated seed in 0·1% colchicine. Selection for autotetraploids was effected by visual observations in the C_2. Differences between and within the varieties and hybrids in mean percentage of fertility were wide. Selection within C_3 progenies of the hybrids resulted in an increase in fertility, but it was not possible to increase fertility in the varieties by similar selection. Two-rowed autotetraploid barleys were more fertile than six-rowed, but in all cases fertility was lower than in the diploids. The meiotic irregularities observed could not be regarded as causing the differences in fertility between the hybrids and varieties. It was concluded that genetically controlled, physiological sterility is at least partly responsible for reduced fertility in 4*x* barley.

25 *Johnson, L. P. V. & Paul, G. I. Inheritance of maturity period in barley.* (*p. 50*). (*Abst.*).

The data obtained could be satisfactorily interpreted by postulating that the parents in each late x early combination differed as regards alleles with an additive action at two loci. Theoretically, such a cross ($a_1a_1b_1b_1$ x $aabb$) would produce six F_2 breeding types, viz. late, intermediate and early homozygotes, and late, intermediate and early heterozygotes in the ratio 1 : 2 : 1 : 4 : 4 : 4. The observed frequencies were in good agreement with this expectation. Minor discrepancies were attributed to modifiers, the nature of which could not be determined.

26 *Clark, G. M. & Boyes, J. W. Colchicine-induced tetraploid buckwheat.* (*p. 51*). (*Abst.*).

Tetraploids of *Fagopyrum esculentum* 'Silver Hull' had gigas characters, together with a slight decrease in pollen fertility. Multivalents were observed at meiosis. Propagation of 2*x* and 4*x* shoots from nodal cuttings was successful. The possibility of using the tetraploid as a commercial variety is being explored.

27 GLUŠČENKO, I. E.
(Remarks on the Tenth International Congress of Geneticists).
Agrobiologija (Agrobiology) 1958 : No. 6 : 145–54. [Russian].

The work at the above congress is briefly surveyed from the Mičurinist viewpoint [cf. XXIX, 926–1161].

28 PROUT, T.
A note on Reeve's method for estimating heritability with assortative mating.
J. Genet. 1958 : **56** : 48–54.

Reeve developed a method for estimating heritability in progeny tests in which the parents are selected and mated assortatively [XXIII, 2312]. In the present paper, this method is modified to eliminate the assumption that the environmental variances of the parent and offspring generations are equal. It is also shown how these two variances can be estimated for comparison.

29 JINKS, J. L. & STEVENS, J. M.
The components of variation among family means in diallel crosses.
Genetics 1959 : **44** : 297–308.

Previous analyses of diallel-cross data by the senior author and his colleagues [XXV, 2624, XXVII, 1011 and XXIX, 59] are extended to take into consideration the interrelationships of the parents in the diallel cross. Seven heritable components of variation are estimated: D, H_1, H_2, I, J, L_1 and L_2. Deviation from random gene distribution in the parental lines and linkage are detected by heterogeneity in the estimates of I and J. Marked differences in the nonallelic interaction components of variation were noted between the 1952 and 1953 data.

30 Mather, K. & Morley Jones, R.
Interaction of genotype and environment in continuous variations: I. Description.
Biometrics 1958 : **14** : 343–59.

The paper begins with a discussion of the differences between two genotypes in two environments: a situation which can be described in terms of three parameters measuring respectively the genetic difference, the effect of environment and the interaction of genotype and environment. The relations between the four phenotypes can be described in terms of inequalities between the parameters. The description is then extended to three genotypes *AA*, *Aa*, *aa* in two environments, needing two genetic parameters and two interaction parameters. More environments are dealt with by orthogonal components. The variances of randomly breeding populations can then be described in terms of the variances of the parameters. Linkage can be allowed for by considering covariance terms.

31 Morley Jones, R. & Mather, K.
Interaction of genotype and environment in continuous variation: II. Analysis.
Biometrics 1958 : **14** : 489–97.

This paper discusses in detail the components of variance discussed in general terms in part I. It is assumed that all generations are distributed at random over the same range of environments; the genetic components can then be isolated but the interaction and environmental components cannot. Where, in generations such as F_3, the different families are each raised in a separate group, the environmental differences may be separated into those within group and those between group means. The interaction components of variation between groups may then be isolated, but analysis of variation within groups into orthogonal components is not possible.

32 Kojima, K.-I.
Role of epistasis and overdominance in stability of equilibria with selection.
Proc. nat. Acad. Sci. USA 1959 : **45** : 984–89.

A mathematical study is presented of the conditions required for equilibrium, assuming two alleles per locus, constant genotypic values, free recombination and random mating. For two loci, overdominance is required at each and the geometric mean of the dominance variances for each locus must be larger than the additive x additive variance for the two loci. General conditions were not obtained for > 2 loci but it was shown that, for the special and unrealistic case of equal effects and equal gene frequencies at all loci, the amount of additive x additive variance relative to the dominance variance is severely limited if equilibrium is to be maintained.

33 Demerec, M. & Ozeki, H.
Tests for allelism among auxotrophs of *Salmonella typhimurium*.
Genetics 1959 : **44** : 269–78.

In investigations on *S. typhimurium* at the Carnegie Institution of Washington, abortive transduction has occurred in 280 auxotrophic mutants representing 41 different gene loci. This type of transduction, detected by the formation of minute colonies [cf. XXVII, p. 594], is regarded as an indication of functional complementation between similar mutants and as a rule serves for the identification of closely linked, functionally similar genes at different loci. The anomalous behaviour, as yet unexplained, of mutants at the *hisB* locus has however shown that in some cases abortive transduction may fail as such a criterion.

34 Yanofsky, C. & Crawford, I. P.
The effect of deletions, point mutations, reversions and suppressor mutations on the two components of the tryptophan synthetase of *Ecsherichia coli*.
Proc. nat. Acad. Sci. USA 1959 : **45** : 1016–26.

"The effects of deletions, point mutations, suppressor mutations and reversions on the two components of the TSase of *E. coli* were examined. It was found that deletion mutants lacking the A and B genes also lack the A and B proteins. Point mutants at the A locus and point mutants at the B locus formed either an altered form of the corresponding protein or none at all. In each instance where an altered protein was produced it was enzymatically active in one of the three reactions in which the normal component participates. Full revertants obtained from A and B mutants formed what appears to be normal components while partial revertants and some suppressed mutants produced either a mixture of normal and abnormal proteins or a new species of active protein. Suppressed mutants derived from non-CRM formers produced relatively little of one of the two components suggesting that some defect in A or B protein formation exists in these strains." [Authors' summary].

35 CRAWFORD, I. P. & YANOFSKY, C.
The formation of a new enzymatically active protein as the result of suppression.
Proc. nat. Acad. Sci. USA 1959 : **45** : 1280–87.

"Certain tryptophan auxotrophs of *E. coli* form a defective A protein, one of the components of the tryptophan synthetase system [cf. 34]. Examination of a suppressed mutant of one such strain has revealed that, in addition to the altered protein characteristic of the unsuppressed mutant, an A protein with normal catalytic activity is present. Hypotheses for the formation of the second A protein are discussed." Modification of a small portion of the product of the mutant gene by the suppressor gene is regarded as the most likely explanation.

36 STADLER, D. R.
Genetic control of a cyclic growth pattern in *Neurospora*.
Nature, Lond. 1959 : **184** : 170–71.

A proline-requiring mutant (21863a) of *N. crassa* has been found to exhibit a temperature-independent daily cycle in growth pattern, this being termed patch and consisting of alternating regions of dense and sparse mycelium. Independent of proline requirement, patch is controlled by a single gene (*pat*) in linkage group I, proximal to the locus for mating type. Tests for proline requirement were made on plates containing sorbose. Use of a sorbose medium ordinarily causes growth to be restricted to the spot of the inoculum. All *pat* progenies showed "sorbose escape", a radial spread in growth being observed. Without exception, pat^+ progenies remained restricted. The sorbose-escape *pat* colonies were not however affected by any cyclic pattern in growth.

37 LANGRIDGE, J. & GRIFFING, B.
A study of high temperature lesions in *Arabidopsis thaliana*.
Aust. J. biol. Sci. 1959 : **12** : 117–35.

The purpose of the investigation was to test the general hypothesis that at extreme temperatures growth is depressed by the inactivation of one or more especially sensitive reactions and that such depression may be prevented by providing the plant with the normal products of the inhibited reactions. Eight races of *A. thaliana* showed a disproportionately great decrease in growth at 31·5° C., five also exhibiting morphological symptoms of damage. Three of the latter underwent significant increases in growth at 31·5° C., when respectively supplied with vitamins, yeast extract and nucleic acids. The specific stimulating substance in the case of the first two races was biotin, which completely prevented the high-temperature lesion. In the third race, cytidine was the specific substance responsible for a partial alleviation of the lesion. Preliminary study of a temperature-lesion race giving no response to the supplements tested suggested that its sensitivity to temperature was under polygenic control. The three races responding to specific metabolites probably differed, however, from other races primarily at single loci. It is concluded that the results support the hypothesis under test and that the phenomenon of inactivity of single genes at high temperatures and of the resulting limitation in growth may be of importance in determining the climatic tolerance of cultivated plants. It is briefly suggested that one way of overcoming the problem of the presence of a temperature-sensitive gene would be to replace it by its temperature-resistant allele, obtainable from existing germ plasm or by X irradiation.

38 TATUM, E. L.
A case history in biological research.
Science 1959 : **129** : 1711–15.

This article is the lecture delivered by the author at Stockholm, December 1958, when he received the Nobel prize in medicine and physiology, as corecipient with G. W. Beadle and J. Lederberg. In his account of the research on *Neurospora* which led to the discovery that genes control biochemical events, he brings out (1) the roles played by both chance and the exchange of ideas in the success of this work and (2) the value of biochemical mutants of microorganisms in the elucidation of general problems in biochemistry, genetics, microbiology and medicine. In conclusion, he makes predictions as to the possibility of a more complete understanding of the gene and its activity in molecular terms and of the sociological repercussions of such knowledge.

39 BEADLE, G. W.
Genes and chemical reactions in *Neurospora*.
Science 1959 : **129** : 1715–19.

The text is given of the address made by the author at Stockholm, December, 1958, as co-recipient of the Nobel prize in medicine and physiology [cf. 38]. The lecture gives the background to the research on *Neurospora* initiated by the author and Tatum in 1940. Reference is made to early work on the genetics of flower pigmentation, Garrod's concept of "inborn errors of metabolism" and investigations on eye pigments in *Drosophila*.

40 NUŽDIN, N. I.
(Some methodological problems in modern genetics).
Agrobiologija (Agrobiology) 1958 : No. 6 : 23–43. [Russian].

A critical review of research on the material units of heredity by western and Soviet geneticists is presented.

41 KOHIYAMA, M. & IKEDA, Y.
Anomalous genetic interactions observed in *Bacillus subtilis*.
Nature, Lond. 1959 : **184** : 208–09.

The *de novo* appearance of characters not present in the parent strains is reported. The two parents were T16, requiring tryptophane and adenine and resistant to streptomycin (try, ade, str–r) and M12, requiring methionine and histidine and sensitive to streptomycin (met, his, str–s). Tiny T16 x M12 colonies formed on an agar medium supplemented with tryptophane, histidine and streptomycin gave rise to three types of progenies when subcultured on a similar medium: (1) try, ade, str–r, (2) try, str–r and (3) met, his, str–r and uracil-requiring. The character of uracil requirement was not shown by the parents. Tiny colonies appearing on an agar medium supplemented by methionine, histidine and streptomycin (MHS) produced (1) met, his, str–d (streptomycin-dependent), (2) try, ade, str–r and (3) try, str–r progenies when subcultured on a similar medium. The met, his, str–d type gave rise to try, ade, str–r and met, his, str–d segregates when subcultured on the MHS medium. This ability of the streptomycin-dependent type to produce try, ade, str–r segregates "may be explained by the assumption that the streptomycin-dependent progeny consisted of a single cell which had a whole chromosome of T16 and a fragment of M12 at the same time. But the two genetic units might not fully complement one another."

42 BARON, L. S., CAREY, W. F. & SPILMAN, W. M.
Genetic recombination between *Escherichia coli* and *Salmonella typhimurium*.
Proc. nat. Acad. Sci. USA 1959 : **45** : 976–84.

BARON, L. S., SPILMAN, W. M. & CAREY, W. F.
Hybridization of *Salmonella* species by mating with *Escherichia coli*.
Science 1959 : **130** : 566–67.

Evidence has been obtained that strains of *S. typhimurium* and certain other *Salmonella* species possess cells capable of behaving as F^- or recipient organisms in phage-mediated recombination with F^+ or Hfr *E. coli* as donor.

43 JACOB, F. & ADELBERG, E. A.
Transfert de caractères génétiques par incorporation au facteur sexuel d'*Escherichia coli*. **(Transfer of genetical characters by incorporation with the sexual factor of *E. coli*).**
CR Acad. Sci., Paris 1959 : **249** : 189–91.

In F^+ bacteria, the sexual factor *F* is an autonomous genetic element, while in Hfr bacteria it is attached to the distal end of the chromosome [cf. XXVIII, 1130]. From a Hfr strain variants have been isolated in which *F* appears to have become autonomous again, since it is transmitted with a high frequency to F^- bacteria. It behaves, however, as though a small portion of the bacterial chromosome has become attached to it to form a single heritable unit. Thus from a Hfr Lac^+ strain, in which *F* appeared to lie next to Lac^+, a few recombinants obtained by conjugation with an F^- Lac^- strain had received only *F* and Lac^+ from the Hfr parent. These recombinants were unstable, segregating at the *Lac* locus. *F* Lac^+ behaved as a single unit independent of other markers present in the Hfr parent, which were transmitted much less frequently. Similar observations have been made on another Hfr strain, in which the *F* factor is attached to the *Pro* locus.

44 HANSON, W. D.
The theoretical distribution of lengths of parental gene blocks in the gametes of an F_1 individual.
Genetics 1959 : **44** : 197–209.

An expression for the probability distribution of the length of gene block remaining intact through a meiotic cycle is derived on the assumption of no interference. The values obtained are large and indicate that linkages are broken much less frequently than would be desirable in a breeding programme. An exact treatment of the effect of interference was not found. An approximate adjustment is proposed in which the distribution of the number of points of genetic recombination per chromosome is modified by an empirical method.

45 OZEKI, H.
Chromosome fragments participating in transduction in *Salmonella typhimurium*.
Genetics 1959 : **44** : 457–70.

Pairs of genes which may be inferred to be linked from observations on complete transduction have in most cases been found to be transferred together in abortive transduction. In complete transduction, linkage between markers whose phenotypes are not closely related has proved to be very rare and unlinked markers have so far never been found to be carried by a fragment participating in abortive transduction. In transduction of the type A^-B^+ (recipient) x A^+B^- (donor) and the reciprocal A^+B^- (recipient) x A^-B^+ (donor), the frequencies of complete transduction of the two single markers, A^+ and B^+, are dissimilar in the two combinations, whereas the frequencies of two-marker transduction show no reciprocal differences. Among linked markers, the frequency of complete transduction varies but the frequencies of abortive transduction are roughly equal. In the case of unlinked markers, differences in frequency of complete transduction are much greater than in linked markers, while the frequencies of abortive transduction parallel those of complete transduction. The results are interpreted on the basis of the following hypothesis. Fragmentation of the donor chromosome is nonrandom and results in short fragments uniform in size and distribution of markers. Complete transduction is the consequence of crossing over between the chromosome of the recipient and a transduced fragment of the donor chromosome, the probability of incorporation of any particular marker varying according to its position in relation to the ends of the fragment.

46 WILSON, J. Y.
Simultaneous change in both differential and interference distances of chiasmata.
Nature, Lond. 1959 : **184** : 207–08.

Analysis of data from the long arms in the chromosome complements of three clones of *Endymion non-scriptus* has offered evidence of a simultaneous alteration in both the differential and interference distances with changing temperature.

47 ALSTON, R. E. & TURNER, B. L.
Applications of paper chromatography to systematics: recombination of parental biochemical components in a *Baptisia* population.
Nature, Lond. 1959 : **184** : 285–86.

The authors describe the application of paper chromatography to the study of unspecified biochemical characters of a hybrid swarm of *B. laevicaulis* x *B. viridis* and pure populations of these two species in the eastern USA. Individuals showing recombination with respect to chromatographic pattern were invariably intermediate in morphology between the parent species. In contrast to the high degree of individual variation in biochemical characters among the hybrids, the chromatograms of each parental type showed a marked uniformity.

48 PARSONS, P. A.
Some problems in inbreeding and random mating in tetrasomics.
Agron. J. 1959 : **51** : 465–67.

It is shown that when autotetraploids and higher polyploids are inbred, homozygosity is approached much more slowly than when diploids are inbred. If the homozygotes are less viable than the heterozygotes, progress towards homozygosity is even slower. Double reduction causes a certain amount of inbreeding even when mating is random.

49 BANIČ, S.
Transduction to penicillin and chloramphenicol resistance in *Salmonella typhimurium.*
Genetics 1959 : **44** : 449–55.

Transduction of sensitive strains by phage grown on first-step and multistep penicillin or chloramphenicol-resistant mutants has been accomplished. Phage from multistep resistant mutants was capable of transducing sensitive strains only to a degree of resistance corresponding to first-step resistance; it may therefore be inferred that the different genes determining resistance to penicillin or chloramphenicol are not closely linked. Transduction of first-step penicillin-resistant strains by phage from independent first-step mutants resulted in second-step resistance. It is postulated that a polygenic system governs multistep resistance to penicillin or chloramphenicol.

50 CAMPBELL, A. & BALBINDER, E.
Transduction of the galactose region of *Escherichia coli* K12 by the phages λ and λ-434 hybrid.
Genetics 1959 : **44** : 309–19.

"1. The comparative properties of the bacteriophages λ and λ-434 hybrid with respect to transduction of the galactose markers have been studied. Low and high frequency transductions with the hybrid are similar to those with λ.
"2. Heterogenotes produced from lysogenic recipients usually carry alleles from the c regions of both the donor phage and the prophage of the recipient, and exhibit a correlated loss of the *gal*$^+$ character and the c region allel derived from the donor phase

"3. In mixed infection with a transducing phage, a nontransducing phage will increase the probability of transduction. This increase does not occur if the recipient carries a prophage with the same immune specificity as the nontransducing phage.
"4. Triple lysogens carrying two active and one defective prophage have been produced by mixed infection of lysogenic recipients."
[Authors' summary].

51 Starlinger, P.
Zur Herkunft des in der Transduktion durch den Phagen P22 übertragenen Materials. (**On the origin of the material transmitted by the phage P22 during transduction**).
Z. Naturf. 1959 : **14b** : 523–28.

When the multiplication of the phage was allowed to take place in a medium containing P^{32} and in *Salmonella typhimurium* grown for several generations in this medium, both the lytic and transducing activities of the phage offspring were inactivated. When only the bacteria and not the medium were radioactive, only the transducing ability decreased, indicating that the transduced material was already largely present in the donor cells prior to infection and therefore consisted at least in part of bacterial DNA. When the radioactive bacteria were allowed to divide once in a nonradioactive medium before infection, segregation into one radioactive and one nonradioactive transducible unit occurred. To account for the last observation, it is suggested that the first bacterial division, following the Watson-Crick scheme, gives rise to "hybrid" DNA consisting of one radioactive and one nonradioactive strand. In the phage-infected cells a further division then begins which leads to reduplication of transducible parts of the chromosome only, of which, again according to the Watson-Crick model, only half are sensitive to P^{32} decay.

52 Fredericq, P.
Transduction par bactériophage des propriétés colicinogènes chez *Salmonella typhimurium.* (**Transduction of colicinogenic properties in *S. typhimurium* by bacteriophage**).
CR Soc. Biol., Paris 1959 : **153** : 357–60.

A technique by means of which the transduction of colicinogenic properties by bacteriophage may be demonstrated is described. The colicinogenic character was similar to other genetic markers in the condition and rate of transduction, although from previous work it appears to be independent of the chromosome. The results are regarded as supporting the hypothesis of Alfoldi *et al.* [XXIX, 70]. The colicinogenic properties of the donor or acceptor were without effect on the transduction of other markers.

53 Opara, Z.
Effect of chloromycetin on the transformations of streptomycin resistance in pneumococci.
Bull. Acad. polon. Sci. : Sér. Sci. Biol. 1958 : **6** : 471–74.

In experiments on the transformation of the pneumococcal strain R36A to streptomycin resistance by means of a transforming factor derived from a mutant of the same strain, the presence of chloromycetin, which inhibits protein synthesis, prevented multiplication, both when added before and when added after the transforming agent. When added within 30 minutes after the transforming factor, chloromycetin blocked the production of the transformed character, indicating that protein synthesis is necessary for the appearance of the new phenotype.

Symposium on genetic approaches to somatic cell variation given at Research Conference for Biology and Medicine of the Atomic Energy Commission held at Gatlinburg, Tennessee, April 2-5, 1958.
J. cell. comp. Physiol. 1958 : **52** : Suppl. 1 : Pp. x + 410.

As pointed out by A. Hollaender in his brief introduction, this symposium grew out of the previous one on Antibodies: their production and mechanism of action. Contributions dealing with plant organisms and the subject from the more general point of view are abstracted below. Other papers dealt with investigations on serological problems and tumours.

54 *Stern, C. The nucleus and somatic cell variation. (pp. 1–34).*

Referring to both plants and animals, the author surveys the nuclear aspects of somatic cell variation, first considering types of nuclear variation, and then the expression of somatic nuclear variation and the selective properties of somatic-cell variants. In discussing the type of nuclear variation, he examines the following aspects: the caryotypical differences occurring in some plants and animals between somatic and germ cells; nuclear variation of a genetic nature in somatic cells, with reference to somatic crossing over, mutation, point mutation in relation to chromosome aberration, ploidy, aneuploidy, and chromosome breakage and rearrangement; developmental nuclear variations;

and cell variation caused by differential activation of genes. One point of particular interest raised is the possible importance of nonrandom genome separation in somatic cells.

55 *Ephrussi, B. The cytoplasm and somatic cell variation. (pp. 35–53).*

Cases of cytoplasmic transmission reported in bacteria, yeast and *Paramecium* are discussed. In favour of the term epigenetic, recently proposed by D. L. Naney, to denote "all mechanisms that regulate the expression of genetic potentialities, in contradistinction to the truly genetic mechanisms that regulate the maintenance of the structural information", the author indicates the possible application of this distinction in the interpretation of cytoplasmic inheritance, suggesting that some cases depend upon a genetic process, i.e. transmission of particles carrying their own structural information, while others may depend primarily on epigenetic phenomena involving functional states of the nucleus.

56 *Brink, R. A. Mutable loci and development of the organism. (pp. 169–95).*

Mainly with reference to published work on variegated pericarp in maize, controlled by P^{rr} and the transportable entity modulator (*Mp*) at the locus *P*, a discussion is given of the significance of mutable loci in this crop in elucidating the process of ontogenetic differentiation. In contrast to McClintock's view of the positive significance of mutation controlled by the *Ac–Ds* system to developmental theories, the general conclusion is reached that the regulatory action of *Mp* on the expression of pericarp colour has only limited significance in this connexion. The basic event of the transposition of *Mp* away from locus *P* is randomly distributed among the dividing cells at all doses of *Mp*; thus *Mp* fails in an essential respect to produce patterns of expression characteristic of normal differentiation. Nor is there any evidence in support of the possible interpretation that transposition is actually a means whereby *Mp* regulates gene action during ontogeny. Furthermore, any hypothesis of development based on mutation as a factor in differentiation involves the fundamental difficulty of the initial lack of distinction between the reproductive and somatic tissue in the Weismannian sense in the higher plants.

57 *Lederberg, J. Genetic approaches to somatic cell variation: summary comment. (pp. 383–401).*

Among the points made in Lederberg's comments on the contributions were the following. The view is expressed that biologists tend to show a strong antisexual bias in their approach in investigations on somatic cells, the outlook with regard to the ultimate possibility of Mendelian analysis being negative. In discussing Ephrussi's proposals of the terms epigenetic and genetic, attention is drawn to the likelihood that use of the term epigenetic would be confusing, since the word is already widely current in a different sense. The following approach is suggested and extended. A category of genetic information may be defined as "nucleic", depending on the sequence of nucleotides in a nucleic acid. "Epinucleic" information, on the other hand, is expressed as an aspect of nucleic-acid configuration other than nucleotide sequence or in polypeptide or polyamine adjuncts to the polynucleotide. Since a mechanism for the determinate, systematic alteration of nucleotide sequences cannot readily be visualized to account for cellular differentiation, chromosomal nucleic variation, i.e. gene mutation, has been the least popular element in all genetic models of differentiation, most of which have therefore been based on plasmagenes (extranuclear nucleic) and steady states (extranuclear epinucleic). The hypothetical category of epinucleic variation of the chromosome should not however be overlooked. Genetical speculation concerning development has been dominated by the doctrine of the conservation of the genetic constitution in all the cells of an organism. Another working hypothesis should now be tried out: the conservation of nucleic information, or at any rate chromosomal nucleic information, in normal development.

58 SÁNCHEZ-MONGE, E.
El tamaño de las poblaciones en la mejora de plantas. II. Plantas de alogamia parcial. (**Population size in plant breeding. II. Partially allogamous plants**).
An. Estac. exp. Aula Dei 1959 : **6** : 81–93.

In this second paper [cf. XXIV, 2608], starting from a homogeneous heterozygous population (F_1), the author shows that if P_n is the probability of the appearance of the homozygous dominant genotype for one locus in the *n*th generation, when the rate of autogamy is $u < 1$, then $P_n = \frac{1}{2}uP_{n-1} + \frac{1}{4}$. The minimum number, N, of plants which may be expected to contain a single plant dominant and homozygous for r loci, the probability of its absence being less than P, is given by $(1 - P_n{}^r)^N < P$; for the dominant phenotype, the equivalent expression is $[1 - (1 - P_n)^r]^N < P$. When the population is in equilibrium, the limiting value p of P_n is given by $p = \frac{1}{4 - 2u}$, the maximum and minimum values being $p = \frac{1}{2}$ for an autogamous population ($u = 1$) and $p = \frac{1}{4}$ for an allogamous population ($u = 0$). Tables are included giving the values of N for 1, 2, 5 and 10 loci in the F_1 to F_{10} and the equilibrium population at eight different values of u and at P values of 10, 1 and 0·1%.

59 KOJIMA, K.-I.
Stable equilibria for the optimum model.
Proc. nat. Acad. Sci. USA 1959 : **45** : 989–93.

Wright showed that stable equilibria did not occur in his optimum model for the cases of no or complete dominance [V, 844–5]. It is shown here that stable equilibrium points exist for the cases of partial dominance or overdominance. A procedure for finding the points when two loci are involved is illustrated.

60 MORAN, P. A. P.
The theory of some genetical effects of population subdivision.
Aust. J. biol. Sci. 1959 : **12** : 109–16.

It is shown that, in a probability model involving two subpopulations of haploid monecious individuals between which migration takes place, the asymptotic rate of drift to homozygosity is very little affected by subdivision of the population, given that there are no selective effects. It is also shown, using a deterministic model involving two subpopulations on which selection acts in equal intensity but in opposite directions, that intermigration results in stable polymorphism and consequently drift towards homozygosity is greatly retarded.

61 OGUR, M., ST. JOHN, R., OGUR, S. & MARK, A. M.
The direct estimation of mutation rate from mutant frequency under special conditions.
Genetics 1959 : **44** : 483–96.

A theoretical analysis of the growth of a mixed microbial population of normal and mutant cells in a medium totally selective against the mutant is presented. The analysis predicts the achievement of population equilibrium in which the mutant frequency is numerically equal to the mutation rate. The results of applying the analysis to the spontaneous cytoplasmic mutation to respiration deficiency in yeast are given. Strain-dependent rates of mutation estimated from the mutant frequency at population equilibrium fall within the values obtained by other investigators by more laborious methods. The probable errors introduced into the estimates of mutation rate by the authors' method as the result of phenomic lag and plating attached buds have been calculated. The possible application of the principles underlying the analysis to other systems is indicated.

62 ROBERTS, C. F.
A replica plating technique for the isolation of nutritionally exacting mutants of a filamentous fungus (*Aspergillus nidulans*).
J. gen. Microbiol. 1959 : **20** : 540–48.

A replica-plating technique for isolating auxotrophic mutants and mutants unable to utilize particular sugars as sole carbon sources is described. Its efficiency in recovering auxotrophic mutants is about the same as that of the much more laborious method of total isolation.

63 RYAN, F. J. & KIRITANI, K.
Effect of temperature on natural mutation in *Escherichia coli.*
J. gen. Microbiol. 1959 : **20** : 644–53.

"The mutation rate from histidine auxotrophy to prototrophy in *Escherichia coli* was measured during growth and in the stationary phase at different temperatures. During growth the rate of mutation/mutable unit/hr. had the same temperature coefficient as the rate of growth. Therefore the rate of mutation/mutable unit/generation was the same at all temperatures. The temperature coefficient of the rate of mutation/unit/hr. during the stationary phase may be the same as that during growth, indicating that although mutation is slower in this phase it may involve the same process as during growth." [Authors' summary].

64 NYBOM, N.
(Plant breeding with the aid of induced mutations).
Agrobiologija (Agrobiology) 1958 : No. 6 : 44–49. [Russian].

This concludes the translation of an article already summarized [cf. XXIX, 610 and 3573].

65 STEIN, W. & LASKOWSKI, W.
Zur mathemathischen Analyse der Strahleninaktivierung mikrobiologischer Objekte verschiedenen Ploidiegrades unter Berücksichtigung genetischer und nichtgenetischer Anteile. **(On the mathematical analysis of inactivation by radiation in microbiological material with different degrees of ploidy, with special reference to genetic and nongenetic components).**
Z. Naturf. 1958 : **13b** : 651–57.

Formulae for survival are elaborated, which take into account both recessive and dominant lethal mutations as well as nongenetic effects. The use of strains of different degrees of ploidy which have originated endomitotically and are completely homozygous is stressed as being of importance in this kind of analysis; such strains are available in *Saccharomyces*.

66 ALEXANDER, R. R.
A genetic study of a large cell strain of *Escherichia coli*.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–114 : 2212–13. (Abst.).

On the basis of data from previous investigations [cf. XXVIII, 1214] and the present study, it is tentatively concluded that both the large-celled mutant P6 and the parental strain 82/r are either diploid or polyploid and that P6 is the result of a gene mutation. This mutation could be capable of interference in cell division, which would bring about the observed increase in the mean number of nuclei per cell. This increase could in turn be regarded as the cause of the increases found in the contents of DNA, RNA and dry weight per cell in the mutant, as well as of its enhanced resistance to radiations.

67 COLBURN, R. W.
A phenylalanine-tyrosine-deficient strain of *Neurospora crassa*, isolated by filtration enrichment.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–257 : p. 2435. (Abst.).

Using a modified "filtration enrichment technique" with the microconidial strain of *N. crassa*, high yields of biochemical mutants were obtained; these included mutants requiring both phenylalanine and tyrosine (*pt*). The initial *pt* strains were almost sterile but one strain which crosses well was obtained. A single gene was found to be responsible for the *pt* phenotype; the *pt* gene is on chromosome IV, approximately 3·9 units distal to *colonial*–4 (7007).

68 LOVELESS, A.
The influence of radiomimetic substances on deoxyribonucleic acid synthesis and function studied in *Escherichia coli*/phage systems. III. Mutation of T2 bacteriophage as a consequence of alkylation *in vitro*: the uniqueness of ethylation.
Proc. roy. Soc. : B 1959 : **150** : 497–508.

"Of a comprehensive set of alkylating agents tested, only two, namely, ethyl methane sulphonate and diethyl sulphate, have been found so to interact with T2 bacteriophage that cells of *Escherichia coli*, infected with phage treated extracellularly, manifest a considerably increased likelihood of yielding mutated phage. Since this increase can occur where the infective titre of the phage and the latent period and average burst size of the infected bacteria remain unchanged, it is considered that the increased mutation rate is a direct consequence of the chemical treatment, although the alkylation itself does not constitute the mutation. A study of the manner of inactivation of the phage by these agents has not revealed any characteristic difference between ethylation and other alkylations which could be held to account for its apparent uniqueness."

[Author's summary].

69 KAUDEWITZ, F.
Production of bacterial mutants with nitrous acid.
Nature, Lond. 1959 : **183** : 1829–30.

The mutagenic effects of nitrous acid are described, chiefly with reference to *Escherichia coli*. With an inactivation rate of 10^{-5}, about 4% of the surviving cells were auxotrophic mutants. The spectrum of the mutants differed significantly from that of mutants induced by ultraviolet radiation and other mutagens or arising spontaneously, but was identical with the spectrum of mutants found after induction by disintegration of incorporated P^{32}. The production of auxotrophs followed a double-hit curve. The rate of mutation was not influenced by the metabolic state of the cell. This finding is consistent with the hypothesis that the mutational effect of nitrous acid on bacteria is direct, i.e. due to the conversion of adenine, guanine and cytosine present in the DNA into hypoxanthine, xanthine and uracil [cf. XXIX, 1206 and 2214]. Contrary to the results of work on the effects of P^{32}, none of the auxotrophic colonies was sectored. This lack of sectored colonies and the double-hit type of mutation curve provide evidence that nitrous acid affects both strands of the double helix of the DNA molecule.

70 KAUDEWITZ, F.
Inaktivierende und mutagene Wirkung salpetriger Säure auf Zellen von *Escherichia coli*. (**Inactivating and mutagenic effect of nitrous acid on cells of *E. coli***).
Z. Naturf. 1959 : **14b** : 528–37.

In relation to length of treatment, the inactivation induced by $NaNO_2$ followed a two-hit curve in nonmetabolizing cells but was greater in metabolizing cells. The percentage of induced auxotrophic mutants also followed a two-hit curve but was independent of the metabolic state of the cells. The results are in agreement with the hypothesis that both inactivation and mutation are directly effected through the deamination of two bases in the subunits of the cellular DNA.

71 Doudney, C. O. & Haas, F. L.
Effect of purine and pyrimidine analogues on reversion of a tryptophan-requiring strain of *Escherichia coli.*
Nature, Lond. 1959 : **184** : 114–15.

Thirty purine or pyrimidine analogues were tested for their effect on the frequency of reverse mutation induced by ultraviolet radiation in an auxotrophic strain, when added to cultures immediately following irradiation. A marked decrease in frequency of mutation occurred as the result of treatment with 6-mercaptopurine, 5-hydroxyuridine and 6-azauracil. The decline in frequency caused by 5-hydroxyuridine was initiated after a lag of about 20 min., completed after incubation for 60 min. and correlated with RNA synthesis. It is postulated that the analogue is incorporated in RNA, thus producing "nonfunctional" RNA and using up the mutagenic substrate. Preliminary studies indicate that 6-mercaptopurine may exert its effect in a similar way. The reduction in mutation frequency resulting from addition of 6-azauracil is similar to that caused by chloramphenicol, being complete within 20 min. Both substances block protein synthesis but, unlike chloramphenicol, 6-azauracil prevents protein synthesis through direct blockage of RNA synthesis. "Uridine will reserve the blockage to ribonucleic acid and protein synthesis and will also prevent the decline in mutation frequency promoted by the compound." It is thus assumed that 6-azauracil, like chloramphenicol, has the capacity to promote decline in mutation frequency by interfering with "mutation stabilization" [cf. XXVIII, 1169 and 3709].

72 Daskalov, H.
(For a creative, not dogmatic attitude to Mičurinist science).
Selskostopan. Misăl 1958 : No. 11 : 859–68. [Bulgarian].

The writer rebuts the charges of having put forward idealist and mechanistic views in his address on problems of heterosis at a conference in 1955 which are imputed to him by R. Georgieva. Georgieva objected to the use of such terms as gene, heterotic varieties and hybrid vigour and also to Daskalov's theory of heterosis. Daskalov explains that the term gene was used broadly in the sense of hereditary unit, while the other terms criticized are stated to be fully justified on Mičurinist grounds. Georgieva herself is criticized for (1) a dogmatic interpretation of Mičurinism, (2) inadequate techniques in her own experiments and (3) drawing wrong theoretical conclusions. In this last connexion Georgieva is cited as saying that the early parent "predominates" in hybrids. In Daskalov's own experiments with 10 x Bison and several other Bulgarian tomato hybrids, the F_1 was usually earlier than either parent and hence neither parent could have predominated.

73 Turner, H. N.
Ratios as criteria for selection in animal or plant breeding, with particular reference to efficiency of food conversion in sheep.
Aust. J. agric. Res. 1959 : **10** : 565–80.

"This paper develops formulae for writing the heritability of any ratio, as well as its genetic correlations with its numerator and its denominator, in terms of the relationships between the numerator and the denominator. From these formulae the likely result of selecting for the ratio can be predicted, for a given range of values of the genetic and phenotypic parameters of the numerator and denominator. The formulae can be used for any ratio, provided gene x environment interactions and epistasis can be neglected.

"The theoretical predictions are confirmed by results from experimental selection groups, in which the observed correlated responses are all in the predicted direction, and in most cases agree well in magnitude."

[From author's summary].

EVOLUTION

74 Scriven, M.
Explanation and prediction in evolutionary theory.
Science 1959 : **130** : 477–82.

The author examines on a logical basis the attempts of Darwin and other biologists to define the principles of evolution in the form of universal laws and to base predictions on these laws, and contrasts their lack of success in prediction with the effectiveness of the explanations they offered concerning past evolutionary events.

75 Haldane, J. B. S.
The theory of evolution, before and after Bateson.
J. Genet. 1958 : **56** : 11–27.

An assortment of topics is discussed, of which the following may be singled out. (1) Selection can be usefully considered by taking five populations: S, all the organisms of the species in the area considered; $\acute{S}$, the progeny of S; P, those members of S which are parents of $\acute{S}$ but each represented as many times as it has offspring; G, the gametes of P; and H, the gamete population after selection. (2) Two types of genotypic selection are distinguished: effective, which alters gene frequencies; and ineffective, which does not. Selection can be strong though ineffective. (3) The prospects of completely characterizing an interspecific difference in biochemical terms are considered. (4) The problem why many phyla have failed to develop features which would seem to be of selective value is touched upon. (5) It is suggested that discontinuous variation may ultimately derive from discontinuity at the subatomic level. (6) Attention is directed to the problem of synchronous evolution of morphological and biochemical features in plants and psychological traits in the animals pollinating and distributing them.

76 HEBERER, G.
Charles Robert Darwin.
Naturwissenschaften 1959 : **46** : 241–48.

Darwin's most important work is reviewed, showing how his ideas on evolution developed. Subsequent modification of the theory of natural selection resulting from advances in genetics is also discussed.

77 DARLINGTON, C. D.
The origin of Darwinism.
Sci. Amer. 1959 : **200** : 60–66.

An account is given of the work of pioneers of the modern concept of evolution and of the contemporary criticism that Darwin's theory of natural selection was not new. It is argued that Darwin's standpoint concerning the central issue of selection *vs.* direction through inheritance of acquired characters was equivocal, and an analysis is made of the role played by this ambiguity and other factors in the impact made by his work and also of the motives underlying his apparent disregard of his predecessors.

78 MILLER, S. L. & UREY, H. C.
Organic compound synthesis on the primitive earth.
Science 1959 : **130** : 245–51.

Recent work elucidating the problem of organic synthesis prior to the origin of life is reviewed. The authors favour the view that the primeval atmosphere was reducing and that ultraviolet rays provided the principal energy source for synthesis of such compounds as the aminoacids. The modes of origin of organic phosphates and porphyrins are obscure. Much of the work referred to was published in the Moscow symposium on the origin of life [XXIX, 908].

CYTOLOGY

79 TAKATS, S. T.
Chromatin extrusion and DNA transfer during microsporogenesis.
Chromosoma 1959 : **10** : 430–53.

Studies using H^3-cytidine as a label for nucleic acid pyrimidines in anthers of *Lilium longiflorum* and *Allium cepa* showed that the extranuclear chromatin globules associated with the microsporocytes are not transferred from the tapetal cells, as previously believed [cf. XXIII, 65], but are extruded from the microsporocytes. Extrusion is thought to be an artifact of handling and fixation.

80 JACKSON, R. C.
A study of meiosis in *Haplopappus gracilis* (Compositae).
Amer. J. Bot. 1959 : **46** : 550–54.

As previously reported, *H. gracilis* has the low chromosome number of $n = 2$ [XXVIII, 1193]. Further study has shown that each pair of chromosomes may be easily recognized by their size and relative arm lengths throughout the various stages of meiosis, beginning with pachytene. Mitotic and meiotic observations indicated that a conspicuous heteropycnotic knot at pachytene on the chromosome designated B is the nucleolar organizer. Other recognizable regions were observed but further study is required to discover whether additional regions on chromosomes A and B may be used as markers.

81 WILSON, J. F.
Studies on the nature of gene-controlled protoplasmic incompatibility in *Neurospora crassa.*
Diss. Abstr. 1959 : **19** : LC Card Mic 59–290 : 2217–18. (Abst.).

Heterocaryosis in *N. crassa* is known to be controlled, at least in part, by C and D and their alleles c and d [cf. XXVII, 1008]. Transfer of protoplasm between incompatible strains by means of a micropipette resulted in death of the recipient cells in most strains, whereas transfer of protoplasm between compatible strains had no lethal effect. Reciprocal transfers between various pairs of incompatible strains revealed marked differences in degree of lethality, ranging from 100% of the recipient cells in every case of two-gene disparities to none killed in the transfer *cd* → *Cd*. Injection with extracts from mass cultures gave results paralleling those obtained by injecting protoplasm, except that the extracts were less lethal in certain combinations. Various chemical and physical tests suggested that extract activity is (1) associated with the "larger intracellular particulate matter and with the fraction containing microsomes and colloidal material", and (2) due to the presence of a protein or proteins, with the possible involvement of DNA.

82 YAMASAKI, N.
Differentielle Färbung der Chromosomen der ersten meiotischen Metaphase von *Cypripedium debile*. (**Differential staining of the chromosomes of the first meiotic metaphase of *C. debile***).
Chromosoma 1959 : **10** : 454–60.

Simultaneous fixation and staining with a mixture of orcein-acetic acid and HCl, followed by the Feulgen reaction, allowed deeply stained transverse striations to be seen on the MI chromosomes of pollen mother cells; the striations were constant in number, width and position.

83 WILSON, G. B., MORRISON, J. H. & KNOBLOCH, N.
Studies on the control of mitotic activity in excised roots. I. The experimental system.
J. biophys. biochem. Cyt. 1959 : **5** : 411–20.

Mitotic activity in excised roots of ***Pisum sativum*** in a balanced salt solution was favoured by addition of sucrose, glucose, fructose and glyceraldehyde. Mannose was ineffective in promoting mitosis and galactose and 2-deoxy-D-glucose had a toxic effect. Initiation of mitosis in the presence of glucose was inhibited by the higher concentrations of the respiratory inhibitors malonic acid and KCN and probably by the uncoupling agent 2,4-dinitrophenol. Some Krebs cycle activity therefore appears to be essential for initiation of mitosis. The glucose-initiated mitosis was not notably affected by chloramphenicol or urethane. The fact that mitosis proceeded normally in the case of lower concentrations of the KCN and malonic acid lent support to the hypothesis that a shift from aerobic to anaerobic respiration occurs between resting phase and division.

84 BHASKARAN, S. & SWAMINATHAN, M. S.
Stage of deoxyribonucleic acid synthesis during mitosis and meiosis.
Curr. Sci. 1959 : **28** : 335–36.

Microspectrophotometric study of root-tip and pollen-mother cells of *Secale cereale* respectively indicated that DNA synthesis during mitosis is initiated and completed during interphase while during meiosis I it is initiated during preleptotene and completed during leptotene.

85 PATAU, K. & SRINIVASACHAR, D.
The DNA-content of nuclei in the meristem of onion roots.
Chromosoma 1959 : **10** : 407–29.

Studies were made using the microphotometric two-wavelength method for the determination of DNA content. Some variation appeared to be due to errors caused by nonspecific absorption and direct evidence of errors resulting from disproportionality of the contents of Feulgen dye and DNA in the preparations was obtained. If such errors are taken into account the results are fully compatible with the hypothesis that the DNA content per complete genome is strictly constant except during the period of DNA doubling in interphase.

86 EVANS, H. J. & SAVAGE, J. R. K.
The effect of temperature on mitosis and on the action of colchicine in root meristem cells of *Vicia faba*.
Exp. Cell Res. 1959 : **18** : 51–61.

The duration of mitosis and of interphase were differently affected by changes in temperature. The mitotic rate increased linearly with increase in temperature between the range 3° C. to 25° C. An increase in temperature reduced the time required for colchicine to block all the cells at metaphase and also resulted in a more rapid toxic action.

87 GERSCHENFELD, H. M. & SOLAN, A. J.
Acción de una sulfonilurea hipoglucemiante sobre la mitosis. (**Action of a hypoglycemic sulphonylurea on mitosis**).
Rev. Soc. argent. Biol. 1957 : **33** : 90–99.

Growing roots of *Allium cepa* and *Vicia faba* were treated for 4–24 hr. with 1-butyl-3-p-toluyl-sulphonylurea in concentrations of 0·037 M to 0·0001 M. At concentrations of 0·01–0·001 M, c-mitoses were induced and higher doses produced toxic effects in both resting and dividing cells. Attempts to produce polyploids were unsuccessful, possibly because of the toxicity of the compound. Glucose had no antagonistic effect. The sulphonylurea did not inhibit the c-mitotic action of colchicine but was able to prevent the formation of c-tumours. It appeared to decrease the rate of entry of the cells into mitosis.

88 TAYLOR, J. H.
Autoradiographic studies of nucleic acids and proteins during meiosis in *Lilium longiflorum*.
Amer. J. Bot. 1959 : **46** : 477–84.

An analysis was made of the incorporation of glycine-C^{14}, orotic acid -C^{14} and cytidine-H^3 into the nucleic acids and proteins of sporogenous and tapetal cells before and during meiosis. DNA synthesis occurred only during premeiotic interphase in sporogenous cells. The tapetal cells synthesized DNA during two periods, once when the microsporocytes were at the zygotene stage and again during pachytene; both periods of synthesis were regularly followed by mitosis. Accumulation of RNA in both the nuclei and cytoplasm of the microsporocytes occurred at stages up to late leptotene. After this period, labelled RNA accumulated almost exclusively in the microsporocyte nuclei and at a slower rate than in the earlier stages. Determinations of DNA synthesis, as measured by incorporation of glycine-C^{14} and orotic acid-C^{14}, were similar and confirmed earlier results with inorganic phosphate-P^{32}. These two first-mentioned labelled compounds, however, gave dissimilar results for RNA synthesis. With glycine-C^{14}, incorporation of the label of RNA ceased during DNA synthesis in the sporogenous cells. Glycine-C^{14} was not utilized to a significant extent at any time by tapetal cells for RNA synthesis but was used in considerable amounts for DNA and protein synthesis. Orotic acid-C^{14} was incorporated into the RNA of both the tapetal and sporogenous cells at various times during microsporogenesis, apparently including the interval of DNA synthesis. As measured by incorporation of glycine-C^{14}, protein synthesis in sporogenous cells was relatively rapid in both nucleus and cytoplasm during premeiotic interphase and leptotene, continuing during the remainder of prophase but at a greatly reduced rate. In tapetal cells, protein was synthesized prior to each mitosis, but the most rapid rate of synthesis occurred when the microsporocytes were in late prophase and later stages. This accumulation of protein may be necessary for the secretory activity of the tapetum after meiosis, when the thick walls of microspores are formed.

89 SPARROW, A. H., SPARROW, R. C. & POND, V.
Sterile culture of excised anthers of *Trillium erectum*.
Quart. Progr. Rep. Biol. Dep. Brookhaven Nat. Lab. 1959 : BNL 550 (S–49) : p. 34. (Abst.).

Of nine media tested, the best was modified Bonner's medium plus coconut milk. Anthers transferred as early as leptotene developed normally, the time span from early meiotic prophase to microspore mitosis being 10–14 weeks at 4·6° C., which appears to be similar to that for anthers *in situ*. No appreciable difference in degree of chromosome fragmentation was found between anthers *in vitro* and *in situ*.

90 BOLINGER, A. I.
The frequency of chromosomal aberrations following a low dose of X radiation.
Diss. Abstr. 1959 : **19** : LC Card Mic 58–5117 : 2438–39. (Abst.).

"The effects of 50 r of X radiation on the induction of chromosomal aberrations in the microspores of *Tradescantia paludosa* were studied. A series of experiments designed to test the sensitivity of the chromosomes to a low dose of X radiation given at various intensities in air and in an 80 per cent carbon monoxide - 20 per cent oxygen mixture was performed.

"A study of spontaneous aberration frequency indicated that none of the conditions under which the plants were grown, or to which they were subjected, during the course of the investigation affected the spontaneous aberration rate; thus, any increase in the aberration frequency could be attributed to the effects of X radiation.

"There was a gradual increase in the aberration frequency following exposures in air to intensities ranging from 0·50 r to 100 r per minute. When higher intensities of 200 r and 400 r per minute were used, the aberration frequency was decreased to the level observed at 4 r per minute. An explanation for this decreased frequency at higher intensities is not readily available; however, the explanation may lie in a physiological effect of a low dose given at high intensities which favors restitution over reunion. A threshold intensity for delivering the dose was not reached since an intensity of 0·25 r per minute increased the aberration frequency over the spontaneous rate.

"Control experiments designed from the methods of calibration of the X-ray unit for the various intensities used indicated a difference in the biological effectiveness of X rays from 250 kv filtered by copper and by aluminum, since a total of 50 r filtered through copper was much less effective in inducing chromosomal aberrations than was the same dose filtered by aluminum.

"The effect of a carbon monoxide inhibition of cytochrome oxidase in increasing aberration frequency reported by other investigators was not observed following treatment with intensities of 1 to 100 r per minute. An increase in aberration frequency above that found in air at intensities of 200 r and 400 r per minute is not explained. If this response is considered to be the result of an inhibition of cytochrome oxidase, which ordinarily releases energy for restitution, then intensity has a differential effect on this inhibition when low doses are used. If the lack of effect at low intensities is attributed to an anaerobic system which supplies enough energy for restitution at low dose rates, then at higher intensities and doses more breaks are present simultaneously than the cell can provide energy for restitution. The breaks are then held open long enough to favor reunion over restitution.

"The use of an arbitrary measure of breaks per cell as an attempt to establish a common denominator for low aberration frequencies supported previous conclusions.

"A differential sensitivity of the microspores of *Tradescantia paludosa* to a low dose of X radiation given under various experimental conditions has been found."

[Author's summary].

91 Kihlman, B. A.

The effect of respiratory inhibitors and chelating agents on the frequencies of chromosomal aberrations produced by X-rays in *Vicia*.

J. biophys. biochem. Cyt. 1959 : **5** : 479–90.

Nitrosophenylhydroxylamine-ammonium (cupferron), KCN, NaN_3, ortho-phenanthroline, α, α^1-dipyridyl and ethylenediaminetetraacetate (EDTA) were tested for ability to (1) enhance the frequencies of chromosomal aberrations induced by X rays in root tips of *V. faba*, and (2) inhibit oxygen consumption of excised roots of this plant. In all cases a close correlation was found between inhibitory effect on respiration and enhancement in radiosensitivity. When gas mixtures containing low concentrations of oxygen were bubbled through the solutions in which the roots of the seedling were immersed, EDTA, dipyridyl and ortho-phenanthroline did not have any appreciable effect on respiration and were without influence on radiosensitivity. KCN, NaN_3 and cupferron, which strongly inhibited respiration, increased the frequencies of aberrations at low concentrations of oxygen. The relationship between oxygen concentration and radiosensitivity was determined in both the presence and absence of cupferron. When cupferron was present, the radiosensitivity was affected by oxygen concentrations 30 times lower than those effective in the absence of the inhibitor. With a 100% oxygen concentration, an increase of about 20% was obtained when cupferron, EDTA or KCN was present. In oxygen-free nitrogen only, cupferron and KCN caused a slight but barely significant increase in the X-ray effect, whereas EDTA failed to bring about any enhancement. It is concluded that at present the effect of cupferron or KCN on X-ray sensitivity at high pressures of oxygen cannot be satisfactorily explained. Neither the hypothesis based on the inhibitory effect upon respiration and the corresponding accumulation of organic peroxides, nor the hypothesis that a complex is formed between the compounds in question and metals localized in sites other than the respiratory enzymes, is regarded as an acceptable explanation.

92 Fetner, R. H.

The production of chromosome aberrations in the microspores of *Tradescantia paludosa* by continuous and fractionated X-irradiation in atmospheres of helium, air, and oxygen.

Diss. Abstr. 1959 : **19** : LC Card Mic 58–5140 : 2440–41. (Abst.).

The microspores were treated with continuous X irradiation of 200 r. and 400 r. and with two equal 200 r. doses separated by intervals of 0–10 hr., the dose rate being 50 r. per min. In an atmosphere of 21% oxygen, there were 2·7 times as many interchanges and 1·4 times as many deletions as in an atmosphere of helium. In 100% oxygen, the corresponding factors were 3·6 for interchanges and 1·8 for deletions. Chromosomes irradiated in helium had twice the reunion activity of those irradiated in the presence of atmospheric oxygen. Damage produced by the first dose in the fractionation experiments remained available for interaction with the second dose for at least seven hours with irradiation in helium, nine hours in air and 10 hr. in pure oxygen. "The differences in aberration frequencies found with successive hourly intervals between doses, in those irradiations given in atmospheres of air, provide a possible explanation of the discrepancies in the reports of other investigators who did not use as frequent intervals between close fractions".

93 WIMBER, D. E.
Chromosome fragmentation in *Tradescantia paludosa* root tips produced by tritium-labeled thymidine.
Quart. Progr. Rep. Biol. Dep. Brookhaven Nat. Lab. 1959 : BNL 550 (S–49) : 35–36. (Abst.).

[Cf. XXIX, 3479].

94 RIEGER, R. & MICHAELIS, A.
Cytologische und stoffwechsel-physiologische Untersuchungen am aktiven Meristem der Wurzelspitze von *Vicia faba* L. III.Mitteilung. Weitere Befunde zur Entstehung und Wirkung "automutagener" Stoffwechselproducte. (**Investigations on cytology and metabolic physiology in the active meristem of the root tip of *V. faba*. III. Further findings on the production and effect of "automutagenic" metabolic products**).
Biol. Zbl. 1959 : **78** : 291–307.

Soaking of seeds of *V. faba* under conditions of partial anaerobiosis released radiomimetic substances into the water [cf. XXIX, 853 and 2049], the amount released increasing with prolonged submersion. When normal primary roots of *V. faba* were treated with the extract for 48 hr., the number of cells with aberrations was nearly twice that found after 24 hr. In the range of tested concentrations, up to 11% of all the chromosomes were involved in breakage or reunion processes and about 80% of all the cells showed some damage. The number of chromatid breaks per cell increased with concentration, but the number per damaged cell soon reached a constant value for a given duration of treatment and increased by 0·5 breaks with each doubling of the period. To account for these observations, it is supposed that sensitivity to the radiomimetic substances occurs for a short period only, probably during the first half of interphase, so that for any one affected cell there is only time for a limited amount of damage to occur.

With normal aerobic soaking of the seeds for 24 hr. prior to submersion, the amount of radiomimetic substance increased, while it decreased if seeds with 4–6 cm. long roots were submersed, indicating that the production of automutagens is associated with very early stages of germination. Active metabolism of the roots is necessary for the uptake of the radiomimetic agent; treatment at 3° C. or in nitrogen induced no aberrations.

95 MOUTSCHEN-DAHMEN, J. & MOUTSCHEN-DAHMEN, M.
Chromosomes deficiencies induced with myleran.
Experientia 1959 : **15** : 310–11.

Previous experiments showed that treatment with myleran resulted in a shortening of the chromosomes of *Vicia* during the development of root tips [cf. XXIX, 1539]. Further investigations now indicate that this shortening is due to chromosome deletions resulting from a deficiency in chromosome reunion after breakage. During development the proportion of breaks affecting metacentric (M) chromosomes increased whilst that affecting acrocentric (S) chromosomes decreased until an equilibrium was reached. The increased proportion of breaks in the M chromosomes was mainly due to an increased frequency of breaks in the nucleolar organizer. As the total amount of chromosome deficiencies increased during development, the S-chromosome deficiencies increased more than the M-chromosome deficiencies. Some deletions of the M chromosome were apparently not viable.

96 MICHAELIS, A., RAMSHORN, K. & RIEGER, R.
Äthylalkohol—radiomimetisches Agens bei *Vicia faba* L. (**Ethyl alcohol—a radiomimetic agent for *V. faba* L.**)
Naturwissenschaften 1959 : **46** : 381–82.

Roots of seedlings of *V. faba* var. *minor* were treated with various concentrations of ethyl alcohol for 24 hr., and afterwards chromosome aberrations, similar to those produced by ionizing radiations, were observed. These included free breaks, isolocus breaks, chromatid translocations, interstitial deletion, duplication deletions and some triradials. Methyl alcohol and propyl alcohol did not have this effect.

97 DUBININ, N. P., SIDOROV, B. N. & SOKOLOV, N. N.
(The genetic consequence of the aftereffect of visible light).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **126** : 179–82. [Russian].

Root tips of *Vicia faba* treated with solutions of fluorescent pigments such as rivanol or toluidine blue that had been exposed for 1 hr. to sunlight or the rays from a daylight lamp had a greater number of chromosome aberrations than roots treated with similar pigments without irradiation. The effect of the radiation was retained by the pigment for 15 min. but was lost after 30 min. and is thought to be due to the action of photooxides formed by the pigment on irradiation.

98 Deysson, G. & Truhaut, R.
Étude de l'activité antimitotique de la mannite-moutarde à l'azote (BCM) sur les cellules méristématiques d'*Allium sativum* L. **(Study of the antimitotic activity of nitrogen-mustard mannitol on the meristematic cells of *A. sativum* L.).**
CR Soc. Biol., Paris 1959 : **153** : 215–18.

The dihydrochloride of di(β-chlorethylamino) 1,6-deoxy-1,6-d-mannitol completely inhibited mitosis in less than 24 hr. at a concentration of 3 x 10^{-5} M, had a mitodepressive effect if continued for more than 24 hr. at 2 x 10^{-5} M and did not affect mitosis until after three days at 10^{-5} M, 5 x 10^{-6} M or 2·5 x 10^{-6} M. A low degree of chromosome fragmentation was induced by the last three concentrations. Concentrations of 1·25 x 10^{-6} M to 10^{-7} M were similar in effect but slower, and 5 x 10^{-8} M and 10^{-8} M induced a little fragmentation but no mitodepression.

99 Deysson, G. & Truhaut, R.
Étude sur la cellule végétale, des propriétés antimitotiques de l'éthylène-imino-oxybutène. **(A study of the antimitotic effects of ethyleneimino-oxybutene on the plant cell).**
CR Soc. Biol., Paris 1959 : **153** : 281–83.

The above compound, tested on root-tip meristems of *Allium sativum*, was without effect at a concentration of 2·5 x 10^{-7} M, had a chromatoclastic and mitodepressive effect from concentrations of 0·5 x 10^{-7} to 10^{-6} M and was mitostatic after seven days at 10^{-6} M and after three days at 2 x 10^{-6} M.

100 Revell, S. H.
The accurate estimation of chromatid breakage, and its relevance to a new interpretation of chromatid aberrations induced by ionizing radiations.
Proc. roy. Soc. : B 1959 : **150** : 563–89.

"If cells are subjected to ionizing radiations as they approach mitosis, chromosome changes are initiated which appear at metaphase as visible discontinuities of chromatid structure and as chromatid exchanges between different chromosomes. The discontinuities have previously been interpreted as surviving examples of a much larger number of chromatid breaks produced at the time of irradiation, and the exchanges as the result of new unions between such breaks that occurred close together.

"Root meristem cells of the broad bean (*Vicia faba*), which had received 50 or 65 r of X-rays, have been used to test a new interpretation of these changes, according to which each chromatid discontinuity arises from a chromatid exchange between two points close together on one chromosome. On this interpretation, the frequency of chromatid discontinuities at metaphase should be much lower than those of most other aberrations: it is shown that the high value usually obtained is due to the inclusion of a large proportion of short unstained but structurally continuous 'gaps', and that the frequency of true breaks is as low as the new hypothesis requires.

"It is accepted that radiation dosage and dose-intensity experiments indicate that chromosomes suffer *primary events* at the points where and when they are crossed by the tracks of single ionizing particles; and also that, although themselves unstable, pairs of such primary events that are close enough together in space and time can together enter a second stable state of *exchange initiation*. If the new hypothesis is also accepted it is argued to be unlikely that this primary event can be chromatid breakage, as is usually supposed, and unlikely also that exchange initiation can be chromatid reunion. It follows that the chromatid exchange itself is structurally established at some later stage, as the two chromosome points continue their joint development in the affected condition." [Author's summary].

101 Read, J.
The breakage of Tradescantia chromatids by ionizing radiations.
Phys. Med. Biol. 1958 : **2** : 258–70.

"Lea's theory of the breakage of Tradescantia chromatids by ionizing radiations is discussed with particular regard to the unexpected efficiency of gamma radiation. [Cf. XVII, p. 350].

"When the number of breaks per micron of track is plotted against the mean linear ion density a curve results which has marked similarity to those illustrating the inactivation of deoxyribonuclease and invertase, which have been fitted to an expression $(1 - \epsilon^{-st})$, where s = mean linear ion density, t = thickness of the molecule. This is based on the assumption that an ion pair left in the thickness t of the molecule is effective. The Tradescantia curve can be fitted better by $(1 - \epsilon^{-st})^2$, which is considered to mean that a chromatid contains two threads, each of which can be broken if an ion pair is left in it. Biological evidence that chromatids contain two threads is reviewed. The hypothesis is developed mathematically with the local value of the mean ion density at each point along the tracks, instead of with an overall mean value, and the delta rays are included.

"The breakage efficiencies of 2·5 kev, 7·5 kev, 12·5 kev electrons, alpha radiation, and (Li + D) neutrons yield target areas for the chromatids which are reasonably consistent."

[Author's summary].

102 PARANOV [BARANOV], P. A.
[The problem of polyploidy. (The present position and the aims in research)].
Chi-wu-hsueh Pao (J. Bot.)/Act. bot. sin. 1959 : **8** : 51–57. [Chinese].

[Cf. XXIX, 1268].

103 CELESTRE, M.-R.
Poliploidia indotta in F_2 da campo magnetico alternativo. **(Polyploidy induced in the F_2 generation by an alternating magnetic field).**
Ann. Sper. agr. 1959 : **13** : 591–95.

Pollen of *Hippeastrum vittatum* treated with an alternating magnetic field of 1830 G. at 640 cycles per sec. was used for pollination. The F_1 showed signs of heterosis and the F_2 contained a number of aberrant forms, one of which bore large double flowers and proved to be tetraploid, with $2n = 84$.

104 LANDA, Z.
(γ-Hexachlorocyclohexane as a polyploidy-inducing agent).
Biol. Plant., Praha 1959 : **1** : 151–56. [Russian].

Using various species of plant it was found that γ-hexachlorocyclohexane is an efficient agent for inducing polyploidy and it is thought that it might replace colchicine for this purpose.

105 JAIN, S. K.
Fitting the negative binomial distribution to some data on asynaptic behaviour of chromosomes.
Genetica 1959 : **30** : 108–22.

Data on the frequency of univalents per cell in three plants of *Secale vavilovii* and two of onion were found to fit the negative binomial distribution very well, and it is suggested that this may be explained as the result of a contagious effect upon other bivalents of a disturbance of pairing in one bivalent.

GENERAL BOTANY

106 TAKEMARU, T.
(Genetical studies on fungi. VIII. The mating system of *Psilocybe coprophila*).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1959 : **72** : 215–19. [Japanese].

This species is tetrapolar though clamps, restricted to the contact zone, are found in common *B* factor matings. The latter gave rise to fruit bodies producing spores of the parental types. Barrages occurred sporadically in common *A* factor, common *B* factor and common *AB* factor matings. [Cf. XXIX, 3495].

107 BREWBAKER, J. L.
Incompatibility and the pollen grain.
Quart. Progr. Rep. Biol. Dep. Brookhaven Nat. Lab. 1959 : BNL 550 (S–49) : p. 36. (Abst.).

Self incompatibility occurs in at least 68 Angiosperm families. Among 210 families surveyed, pollen shedding occurs at the binucleate stage in 132, at the trinucleate in 48 and at either in 20. In 28 genera with binucleate grains, the incompatibility reaction occurred only in the style or ovary, whereas in trinucleate genera inhibition took place on the stigma in 15 genera and in the style in 3. Binucleate grains generally characterize species with gametophytic expression or homomorphic *S* allele phenotypes, while trinucleate grains usually characterize the sporophytic system. It is also noted that: binucleate grains germinate more readily *in vitro* than binucleate; all aquatic plants with submerged flowers appear to be trinucleate; binucleate grains generally have a lower osmotic pressure and survive storage better; and the binucleate condition is phylogenetically primitive.

108 GLENK, H. O.
Methoden zur Sichtbarmachung von Pollenschläuchen im Griffelgewebe an Ganzpräparaten. **(Methods of staining pollen tubes in the stylar tissue of whole mounts).**
Mikrokosmos 1958 : **447** : 121–25.

Methods of staining the callose material of the pollen tube wall and the contents of the tube are reviewed and 27 references given.

TAXONOMY

109 Vasil'čenko, I. T.
(The question of intraspecific categories).
Trud. Bot. Inst. Komarov. Akad. Nauk SSSR (Trans. Komarov bot. Inst. Acad. Sci. USSR) : Ser. 1 1958 : No. 12 : 132–66. [Russian].

An historical review is presented of the efforts of various authors since the time of Linnaeus to classify subspecific varieties and categories. The attempt of A. A. Grossgejm and others to introduce the concept of ecorace and others concerned with the influence of environment is deprecated, since all taxonomic units are in the long run the result of the operation of environmental factors through natural selection. Forms with an unbroken series of intermediates, differing largely in a quantitative manner, such as *Camelina pilosa, C. glabrata* and *C. linicola*, are considered at best to constitute subspecies and certainly not species. The same view is taken regarding the sweet and bitter forms of *Prangos pabularia* in Tajikistan; the bitter form, in addition to being useless for stock feed, differs also in a number of morphological features and has a somewhat different area of distribution, though in many places the two areas overlap. A number of analogous cases are cited. Where differences exist without any tendency to localization, the groups are classed as botanical varieties, which are exemplified by the distinct groups in *Kochia prostrata* and *Anabasis depressa* occurring in the Caucasus. The lowest category recognized is the "form", defined as "a not very profound deviation (within a species), corresponding to peculiarities of conditions of development in a given vegetation period or a given locality, regularly reproducing itself in those conditions from generation to generation".

Subspecies, varieties and forms are all considered capable of giving rise to new species under appropriate conditions.

As regards cultivated plants the opinion is expressed that only the genus and species should be latinized; the confusion that has arisen from mixing taxonomic, ecological and genetical concepts is deprecated and a more unified approach to the problem of the species and its origin from all these standpoints is called for.

CROP PLANTS

110 Gómez Campo, C.
Una fuente de radiación gamma especialmente adaptada a la investigación agronómica. **(A source of gamma radiation specially adapted for agronomic research).**
Bol. Inst. Invest. agron., Madr. 1959 : **19** : No. 40 : 135–45.

A Cs^{137} - Ba^{137} γ radiation apparatus to be erected at El Encín, Alcalá de Henares, Spain, is described. Among its advantages over other types are the 30-year half life of the combination of isotopes used and the cylindrical source which can be adapted to provide acute irradiation of an internal field or chronic irradiation of an external field, the total dose range being 0–125,000 r./hr.

111 **Colonial Research 1957-58. Annual Report of the Colonial Research Council, London 1958** : Pp. 347.

The report includes brief accounts of the chief projects being carried out on crop breeding in the different countries served by the Colonial Research Council of the British Commonwealth.

Report of the Scottish Plant Breeding Station 1959 : Pp. 96.

112 *Director's Report.* (*pp.* 5–22).

Oats. The value of making selections in the environments for which the new varieties are intended has been demonstrated by trials at Pentlandfield, Midlothian, in which 96 fixed lines, derived from 13 different hybrids by selection at Pentlandfield, a locality in Inverness-shire and a third in Argyll were tested against the control, Sun II. Only one line from the Argyll centre gave a yield equal to that of the control whereas the control was equalled or bettered by 21 lines selected at the two centres in the east of Scotland. In nearly all cases in which related lines had been derived from the same hybrids, those selected from the locality in the west produced lower yields than sister lines originating at the other two centres.

Breeding against attack by oat stem eelworm (*Ditylenchus dipsaci*) has resulted in resistant lines which are expected to be ready shortly for multiplication and testing on a field scale.

Herbage plants. Further genecological investigations were carried out on species found in hill districts; a considerable amount of work has been done on *Festuca ovina* and some results have also been obtained for *Agrostis* spp.

Of 194 populations of *F. ovina* from south-east Scotland, 37 were diploid, 123 tetraploid and 34 mixed. Most of the mixed populations were predominantly composed of one chromosome race or the other. The two races differed in their distribution according to plant-community type.

In *F. ovina*, the diploids regularly produce 7_{II}, the tetraploid forms 1 or 2_{IV} and $10–14_{II}$, the triploid $4–7_{III}$ and the hexaploid 1 or 2_{IV} and $17–21_{II}$, with an occasional association of 6 chromosomes. B chromosomes, when present in the $2x$ or $4x$ form, paired only with one another. All plants of *F. heterophylla* had 14_{II}. In *F. rubra*, the hexaploid formed 21_{II}, the heptaploid 2 or 3_{III} and 18 or 19_{II} and the octoploid an occasional quadrivalent and 26 or 28_{II}. Pairing in *F. ovina* ($2n = 28$) x *F. rubra* ($2n = 42$) varied considerably. In extreme cases over half of the chromosomes remained unpaired and the later stages of division were highly disturbed, the plants presumably being completely ♂ sterile. *Lolium perenne* ($2n = 14$) x *F. rubra* ($2n = 42$) showed a very low degree of pairing. A maximum of 4_{II} was seen in one cell while several cells had 28 unpaired chromosomes.

Lead tolerance in populations of *F. ovina* is under investigation. Tolerance has been found in plants with $2n = 14$, 21 and 28. Physiological research has been initiated to elucidate the nature of tolerance, as well as to facilitate the development of a more precise method of measuring it and thus more reliable interpretations of genetical results.

The value of certain morphological characters for the separation of *A. tenuis*, *A. canina* ssp. *montana* and *A. stolonifera*, which are all tetraploid ($2n = 28$), was determined. Palea length expressed as a percentage of lemma length and both size and shape of the ligule proved to be especially useful. *A. canina* ssp. *montana*, *A. tenuis* and hybrids between these species were examined at meiosis. *A. canina* showed a minimum pairing of $5_{IV} + 4_{II}$ while *A. tenuis* regularly formed 14_{II}. Without exception, the hybrids had 14_{II}.

Brassica. Progenies derived from thousand-headed kale x heading broccoli crosses involving early and late cultivars are being studied, with emphasis on resistance to bolting. Two hybrid families of Royal Oak origin are of particular interest. Resistance to bolting is also being sought among thousand-headed kale x kohl-rabi crosses. It is however doubtful whether the various degrees of "bulb" formation are of much feeding value. Furthermore, the recessive character of unthickened stem may possibly be associated with more leafage. Hybrids derived from the kohl-rabi varieties Vienna and Prague have produced most leafage but are susceptible to bolting. Triple hybrids of kale, broccoli and kohl rabi are also being examined for suitable combinations of characters. In addition, the value of thousand-headed kale x cabbage is being explored. Work on thousand-headed kale x sprouting broccoli hybrids has been discontinued. The stems were long and the leaves had small blades on long petioles.

Study of self sterility occurring in a strain of swede continued. The artificial "swede" produced by crossing the turnip Bruce with a hybrid kale has been carried on a generation by hand pollination in self and sib matings. It is highly self sterile but crosses readily with natural swede and rape. Sufficient material is now available for cytological and morphological examination.

Potato. Pentland Crown [2151b(31)] was registered as a commercial variety [cf. XIX, 4026].

Progress was made in breeding for field resistance to late blight. A fifth *R* gene for hypersensitivity to race 1,2,3,4 has been identified in *Solanum demissum* 'CPC2171'. A race of late blight obtained from East Germany was capable of overcoming resistance due to this gene.

In progenies derived from *S. chacoense*, resistance to virus Y is expressed in two ways: a null reaction and a necrotic hypersensitivity. Segregation data have suggested that the two types of response are controlled by the same dominant gene but further evidence is required. Initial triple hybrids of (*S. chacoense* x *S. demissum*) x *S. tuberosum* have been produced with a view to utilizing the virus-Y resistance of *S. chacoense*. No success has been met with in the attempt to cross tetraploid *S. chacoense* as ♀ or ♂ with *S. tuberosum*. A study of the relationships between genes controlling response to virus Y and A in *S. demissum*, *S. chacoense*, *S. simplicifolium* and *S. stoloniferum* is under way. A single pair of genes conditions reaction in *S. acaule* to strains X_L and X_B of virus X. Progress was made in the utilization of the virus-Y resistance found in *S. stoloniferum* and *S. phureja*. Resistance derived from either species operates against a wide array of strains of Y.

At present, two kinds of field populations of root eelworm (*Heterodera rostochiensis*) are distinguishable in Britain by differences in pathogenicity, although in appearance the cysts are similar. The resistance of ssp. *andigenum*

'CPC1673' is effective against one kind, typified by the Boghall population at Pentlandfield, but breaks down against the other kind, typified by the Duddingston population at Pentlandfield. Since the resistance of CPC1673 to the Boghall population was adequate for the original programme of breeding, this was considered as representing the standard level of resistance in parents. This grade of resistance implies that 90% of the plants infected under given conditions have root systems remaining free from cysts. A corresponding level of resistance to the Duddingston population has been sought among wild species during the past two years. For convenience, standard or near-standard resistance to both populations has been termed nonspecific if present in the same plant, "specific" resistance being displayed by plants with standard or near-standard resistance to a specified population but definitely less than standard resistance to the other. The resistance of *S. vernei* ssp. *ballsii* is above standard, nonspecific and polygenic. Hybrids between tetraploids of this species and *S. tuberosum* were very uniform in resistance to the Duddingston population but the degree of resistance was below standard. Selected hybrids will be intercrossed in the hope of counteracting the reduction in resistance. Triple hybrids of (ssp. *ballsii* x *S. demissum*) x *S. tuberosum* are to be discarded since they possessed many wild characters and resembled *S. demissum* in their greater susceptibility to the Boghall population. Confirmation was obtained of specific resistance to the Duddingston population in *S. multidissectum* and *S. neohawkesii*, at a level slightly above standard in the former and slightly below in the latter. Segregation of seedlings with standard resistance in *S. multidissectum* (unreduced gametes) x *S. tuberosum* was suggestive of dominant and monofactorial inheritance. No such segregation occurred in *S. neohawkesii* (unreduced gametes) x *S. tuberosum*. In *S. multidissectum* some resistance to the Boghall population was linked with the standard resistance to the Duddingston population. Resistance to the Duddingston population was also confirmed in *S. sanctae-rosae*, *S. megistacrolobum* and *S. raphanifolium*. Resistance was above standard and nonspecific in the first species but slightly less than standard and specific in respect to the Duddingston population in the other two. Resistance in *S. raphanifolium* is probably controlled by one or very few genes. *S. famatinae* differs from the other diploids in having standard resistance which is specific to the Boghall population. Pending fuller information on the genetics of the host-parasite relationship, there is justification for attempting to use the nonspecific resistance of ssp. *ballsii* as a background upon which to impose specific resistance, provided that the latter is conditioned by one or very few genes. The nonspecific resistance of *S. sanctae-rosae* is also potentially valuable but reduced fertility in crosses between tetraploids of this species and *S. tuberosum* constitutes a difficulty.

Sugar beet. Breeding material was tested for resistance to bolting. Monogerm x multigerm hybrids were back crossed with multigerm sugar beets in accordance with the scheme devised by H. Savitsky for the transference of the monogerm character to desirable strains. Pollen-bearing plants were test-crossed with annual ♂-sterile females to ascertain their suitability for breeding ♂-sterile lines.

113 *Davey, V. McM. Cultivated* Brassiceae: *information available to the breeder.* (*pp.* 23–62).

Literature dealing with cytogenetical and breeding work carried out on the cultivated members of the above group is surveyed, suggestions being made as to fields of investigation requiring more attention. The work discussed includes papers, mostly recent, which have not been listed in Yarnell's comprehensive review [XXVI, 2887].

114 *Gregor, J. W. & Horne, F. R. The significance of the international code of nomenclature for cultivated plants to international trade in herbage cultivars.* (*pp.* 65–71).

With reference to the above code [cf. XXVIII, 2425], the authors examine problems of the registration, testing, description and classification of cultivars and of the setting up of authorities responsible for undertaking these tasks.

115 *Thomson, J. R. The assessment of grass strains at East Craigs.* (*pp.* 72–81).

Methods of evaluating grass strains in spaced-plant trials at East Craigs, Edinburgh, are described, in view of the future role these trials are expected to play in providing information on which to base the descriptions required to accompany national registration of cultivars according to the International Code of Nomenclature for Cultivated Plants. The grasses dealt with are perennial ryegrass, timothy and cocksfoot. The relative earliness or lateness of inflorescence emergence is considered to be the key characteristic of a strain.

116 *Whyte, R. O. & Julén, G. International registration of varieties of herbage plants.* (*pp. 82–91*).

A statement is made as to the views of the Crop Production and Improvement Branch of FAO on the desirability and feasibility of international registration of cultivars and on the possible role of FAO in such an undertaking. Particular reference is made to herbage plants since these, being largely cross-fertilized, present the greatest difficulties in the task of making descriptions of cultivars.

117 *Wilkins, D. A. Sampling for genecology.* (*pp. 92–96*).

The problem of deciding whether differences between local populations are due to selection or to drift is considered. A first requirement is that ecological and geographical differences be not confounded. A second is that the variance between habitats be between populations within habitats and not between individuals. It should be possible to detect selective effects by correlating characters of single plants per population with a metric characteristic of the habitat or by correlating plant characters and habitat characteristics, using population means. It follows that studies of this sort should utilize small samples from numerous sites rather than large samples from fewer sites.

118 **Calendar of the North of Scotland College of Agriculture 1559-60** : Pp. 125.

Mention is made of variety trials of spring and winter wheat, oats, barley, cocksfoot (*Dactylis glomerata*), Italian ryegrass (*Lolium multiflorum*), perennial ryegrass (*L. perenne*), red clover, swede, potato, raspberry, black currant, strawberry, carrot, cabbage, cauliflower, Brussels sprouts and tomato which are being carried out in several localities of the Highlands.

The Research and Experimental Record of the Ministry of Agriculture, Northern Ireland 1957 (1958) : **7** : Pp. 286.

119 *Wright, C. E. & Wilson, E. V. B. Blind seed disease of ryegrass IV. Bulk spore production for use in the induction of large scale epiphytotics.* (*pp. 1–7*).

In connexion with breeding for resistance to blind seed (*Phialea temulenta*) at the Plant Breeding Station, Loughgall, N. Ireland, artificial methods of reproducing the disease and testing plants have been studied. For the bulk production of spore suspensions, autoclaved peas have been found to be markedly superior to any of the agar media tested.

120 *Wright, C. E. Blind seed disease of ryegrass V. Methods of inoculation for use in the induction of large scale epiphytotics.* (*pp. 8–16*).

The spraying method is considered to be more satisfactory than the dipping technique, since it involves less time and labour and has a less severe effect on seed yield [cf. 119].

121 *Morrow, J. W., Proudfoot, K. G. & Wright, C. E. A comparison of pollination systems in relation to plant evaluation in* Lolium perenne. (*pp. 17–26*).

A comparison of open-pollinated, polycross and diallel progenies from clones of the same plants with respect to 14 characters at the Plant Breeding Station, Loughgall, N. Ireland, indicated that the three methods of pollination were of equal worth as means of relative evaluation in the initial selection of basic plants. When absolute evaluation of progenies in relation to a standard control is required, the polycross technique, it is suggested, will produce the most truly representative progenies, since it simulates the conditions normally obtaining in seed multiplication. The polycross method has the additional advantage of giving sufficient seed for sward tests.

122 *Proudfoot, K. G. & Wright, C. E. An assessment of the relative values of three methods of determining the leafiness of perennial ryegrass.* (*pp. 27–30*).

A rapid weighing technique for estimating leaf : stem ratio in perennial ryegrass, in use at the Plant Breeding Station, Loughgall, N. Ireland, is described and compared with two standard methods. The correlation between values obtained by this technique and those from the standard methods are sufficiently high to justify its use in strain evaluation. Each spaced plant is gathered by hand into a neat cone-shaped bundle prior to cutting. After the weight of the bundle has been recorded, the plant is shaken to remove non-heading tillers. The heads are then weighed. Subtraction of the head weight from total plant weight gives a "leaf" weight, "allowing the calculation of a green matter leaf/stem ratio to be made."

123 *Agricultural entomology division.* (*pp. 157–65*).

Potato. In work on resistance to *Heterodera rostochiensis*, testing of seedlings from crosses between resistant types of ssp. *andigenum* and commercial varieties continued. During the past three years, about 25% of the hybrids retained a high degree of resistance; selections of these hybrids are being made for back crossing. The discovery of aggressive biotypes of the pest is reported.

124 *Plant breeding division.* (*pp. 201–09*).

Oats. Transference of resistance to *Erysiphe graminis* to popular commercial varieties by back crossing continued. Some F_1 plants from crosses between Forward, Blenda, Sun II, Stormont Iris and Stormont Grandee were used for multiple crossing to give material derived from four parents. A further series of crosses consisting of Elder x Sun II and Blenda x Marne was initiated. Selections of Elder x Stormont Arrow showing improvement in seed size and kernel percentage over Arrow were subjected to plot tests.

Ryegrass. Strain building continued, as well as testing for resistance to *Phialea temulenta* [cf. 119–20].

Potato. Breeding was initiated in 1957 and is to be mainly concentrated upon resistance to late blight, *Heterodera rostochiensis*, scab and viruses.

Flax. Progress has been made in breeding for resistance to *Polyspora lini.* The character appears to be inherited as a simple dominant.

125 *Plant pathology division.* (*pp. 210–31*).

Potato. Race 1,4 of *Phytophthora infestans* has attacked the hitherto late-blight resistant variety Ulster Torch.

Flax. From investigations on methods of testing for resistance to *Polyspora lini*, *Colletotrichum linicola* and *Phoma* sp. in breeding, other than by field observations, it is concluded that pot techniques are the most efficient. The starting-point of breeding for a combination of resistance to the above pathogens and *Melampsora lini* was Tekstilščik [Textile Worker] x La Plata, these parents being respectively resistant to *M. lini* and all four fungi. Back crossing of segregates resistant to *P. lini* to Tekstilščik has been carried out for a number of years. Application of the pot techniques in 1957 to the material thus developed suggested that plants homozygous for resistance to *P. lini* have now been obtained. Resistance to *Phoma* sp. and *C. linicola* did not reach such a high degree, presumably because selection for resistance had been made previously.

Twenty-seventh Annual Report of the Minister for Agriculture, Dublin 1957-58 : Pp. 176 + 82.

126 *Special technical and advisory work.* (*pp. 63–98*).

Wheat. Progenies from crosses effected to combine high yield, quality, early maturity, vigour and strong straw in spring wheats were further studied at the Cereal Station, Ballinacurra. To extend the scope of this work, additional crosses were made in which parents such as Atle, Atson, Svenno, Kärn II [Kernel II] and Safir [Sapphire] and some of the selections developed at the station were used. Neutron-treated material derived from Atle was further selected. Use of a stem-rust resistant selection of Redman x Hybrid 27 in breeding continued.

Barley. Selections studied at Ballinacurra included derivatives of Spratt-Archer x Kenia and of crosses involving parents such as Herta, Ymer, Carlsberg, Proctor, the X-ray induced mutant XC11 [cf. XXVIII, 3791] and station lines. Progenies of neutron-treated Beorna and XC11 are under investigation. The new fodder barley Banba (Spratt-Archer x Kenia) has been developed [XXIX, 3857].

Potato. Breeding for disease resistance and several other characters continued at the Potato Breeding Centre in Donegal.

127 *Report of the Agricultural Department, University College, Dublin, for the year 1957–58.* (*pp.* [*1*]–[*18*]).

Wheat. A new race of *Puccinia glumarum* attacking the hitherto immune winter wheat Glasnevin Rosa has appeared. It is hoped that hybrids from Glasnevin Rosa x Hybrid 46 will combine the agronomic characters of the former parent with the high degree of rust resistance of the latter. Cappelle Desprez x Heine's 7 and Glasnevin Rosa x Pajbjerg have yielded promising derivatives but these are only at an early stage of breeding.

Oats. Valuable selections have been made from Glasnevin Triumph x Major and Pendek x Minor. The latter cross is expected to give types with short, stiff straw and a low percentage of sterile florets.

Barley. Spratt Archer 37/3 and some of its derivatives offer a source of resistance to loose smut and root eelworm. It is hoped to combine this resistance with the straw strength and earliness of the Swedish varieties Herta, Rika, Ingrid and Agio.

Perennial ryegrass. The new strain Glasnevin is leafy, vigorous and medium late.

Brussels sprouts. Two selections have been respectively named Irish Elegance and Irish Glacier. The former is a high-quality sprout for marketing and the latter a small type suitable for freezing.

128 **Twenty-ninth Annual Report of the University of Birmingham Research Committee, 1957-1958.** Pp. 108.

Nonallelic interaction.

"Although it was shown over ten years ago that non-allelic interactions may be tested for without interference from linkage by scaling tests using first degree statistics, the detection and estimation of the separate effects due to interaction and linkage is still an important field of biometrical genetics. The original scaling tests have been extended to detect the presence of genes showing both linkage and interactions and to separate digenic effects from higher order interactions. At the same time similar tests have been devised for second degree statistics, which prospectively allow the detection of linkage without interference from interaction and of interaction without interference from linkage."

Chromosome behaviour.

The importance of structural differences in determining chromosome behaviour has been demonstrated in relation to (1) synchronization during cell division in *Scilla* and (2) chiasma frequency in interspecific crosses in *Lolium* and *Allium.*

Fungi.

Contrasts are drawn between the behaviour of the nucleus and cytoplasm in sexual reproduction, with particular reference to *Aspergillus* and related fungi. Mutant and normal genes do not compete in reproduction, whereas in a cytoplasm of mixed origin one component may suppress the other. Stable mixed cytoplasms do however exist. Two examples of such cytoplasms have exhibited the "dual phenomenon", which had previously been regarded as exclusively nuclear in origin.

The patterns of complementation characterizing heterocaryons of some biochemical mutants in *Neurospora* may be represented by a linear diagram or complementation map. Eight loci, notably *arginine*-1, *methionine*-2 and a locus for lysine requirement, have exhibited such complementation, which is "probably a chemical interaction between homologous units aggregated as an enzyme forming system or, more likely between homologous, though differently defective, polypeptides aggregating to form the units from which enzymes are shaped. It is suspected that the interaction is concerned with the regulation of the folding and shaping". A similar case in yeast, studied at the University of Washington in collaboration with H. Roman, is compatible with "the conclusion that each class of complementing mutation will map in a distinct region of the gene, with the non-complementing class scattered at loci throughout it".

Rye. Crosses between inbred lines "show heterosis for chromosome behaviour" as well as for floral and morphological characters. Cytological and external characters are not however correlated. An efficient meiosis is therefore not merely a reflection of general vigour, as has sometimes been suggested.

Barley. Study of plants raised from irradiated seeds of two varieties and of the selfed progenies indicated that ionizing radiation may induce continuous variation, although this was mostly retrogressive in the sense that mutation was in the direction of nullifying past improvements by selection.

Potato. An improved technique for assessing resistance to frost damage is being used to grade tuber-bearing *Solanum* spp. and their hybrids. Studies of the time curve of heat production as ice forms in the tissues have revealed differences between susceptible and resistant species. In the latter, ice forms just under the epidermis in such a way that the stem tissues are not permanently injured. Elucidation of interspecific relationships in tuber-bearing species continued. An expedition to Central America has been organized to collect wild species [cf. 540].

Tobacco. Selection in *Nicotiana rustica* was effective in modifying the relative positions of the anthers and stigma and thus the rate of natural outcrossing [cf. XXIX, 4232].

Forty-ninth Annual Report of the John Innes Horticultural Institution, Bayfordbury, Hertfordshire 1958 : Pp. 44.

129 *Williams, W. Department of Plant Breeding.* (*pp. 7–13*).

Apple. The first stages of breeding initiated in 1955 are nearing completion, information being given on the parents used and totals of progenies obtained in breeding specifically for (1) scab resistance, (2) mildew resistance, (3) colour, (4) early ripening, (5) late ripening and (6) triploidy.

Pear-apple hybrids. The following features of pear x apple hybridization are of interest [cf. XXIII, 2939]. The cross is only successful when pear is used as ♀, the variety Fertility giving the best results. The choice of ♂ parent is immaterial and the cross succeeds at both $2x$ and $4x$ levels. Seed set and germination are quantitatively similar to those obtained in intraspecific pear crosses. Although there appears to be no genetical barrier to crossing, hormone treatment is essential. Very few hybrids survive the seedling stage because the root tissues break down rapidly. None has survived on its own roots but the life of the hybrids has been prolonged by grafting on seedling pear and apple. Out of a total of 934 hybrids produced up to 1956, only 21 were alive at the end of 1958. The majority of survivors were from 4*x* parents.

Rubus. In selected lines of the apomictic species *R. nitidioides*, changes in foliar morphology associated with prickle intensities have occurred which are characteristic of other species in the series *Eugrati* of sect. *Sylvatici*. Other important taxonomic characters have remained unchanged. The changes noted are however sufficient to indicate the type of alterations which may occur in seemingly stable apomictic groups under pressure of selection. They suggest that further work along these lines might be an aid to a more realistic taxonomic treatment of the genus.

The frequency of sexual reproduction in apomicts was studied in F_1 progenies from crosses of *R. laciniatus* ♀ with nonlaciniate species as males. All the sexual hybrids had nonlaciniate leaves. Number of sexual seedlings ranged from 6 to 38% among families but no relationship was detected between the frequencies of hybrids and the species used as ♂ parents. The vigour of the hybrids was variable, many being weaker but none stronger than their apomictically produced "sibs".

Strawberry. Selfing has so far caused so great a loss in vigour as to make purposeful selection impossible. Consequently sib crossing, with which the loss of vigour in the first generation is only 15%, has been adopted as the method of producing inbreds. This method has an added advantage in that complementary phenotypes may be chosen for matings. Selection for specific characters is being practised within each line; the final selections will be evaluated by their performance in outcrosses.

Use of (1) older seedlings with a larger root system instead of very small seedlings with only a single rootlet and (2) spore suspensions of known concentration has given successful results in isolating segregates resistant to *Phytophthora fragariae*. Individuals with resistance in the seedling stage have appeared in families of both resistant and susceptible parents.

Seedling 663 (USDA3378 x Early Cambridge) again gave promising results in field trials. It has a long picking season and has proved satisfactory in preserving tests.

Tomato. Potentate and an inbred of *Lycopersicon pimpinellifolium* were injected with $NaH_2P^{32}O_4$ solution through the cut ends of the leaves during flowering. The progenies of irradiated plants (I_1) "were classified according to nodal position of inflorescence and the times at which the first flowers opened were recorded." The two earliest and the two latest plants were selected from each I_1-progeny group. One of the earliest and one of the latest plants in each group were treated with P^{32}. Data on flowering dates of the two sets of I_3 progenies, respectively representing material treated for one generation and two successive generations, indicated lack of a consistent response in *L. pimpinellifolium* but, in the case of both sets of progenies of Potentate, the possibility of increasing quantitative variation in a single character through the use of mutagens was established.

In further work on hybrid vigour, lines from two F_1 hybrids, Hertford Cross and Ware Cross, have been evaluated up to the F_5. From F_2 populations of about 3500 plants of each hybrid, 12 selections satisfied the standards imposed up to the F_5. Two lines from Hertford Cross and three from Ware Cross have equalled or surpassed the F_1 hybrids in early yield. It therefore appears that although F_1 hybrids may in certain circumstances make outstandingly good varieties, their use is not essential for the maximum expression of yield characters. This conclusion is confirmed by data from an 18 x 18 diallel cross, showing that the manifestation of heterosis with respect to yield and components of yield depends entirely on the varieties chosen as parents. If the parents are mediocre, the F_1 hybrids frequently transgress the parental values. When the best parents are used the hybrids do not exceed them in yield. Obviously the best parents already possess a large number of factors with a positive effect on yield and further improvement is thus more difficult. All the data obtained from the 153 hybrids investigated are explicable on the basis described as a relatively simple type of complementary genetic system.

Two developmental periods, (1) from germination to opening of the first flower and (2) from the first flower to the first ripe fruit, appear to be under separate genetical control. A variety may have a high rate of development in one period and low rate in the other. Dominance as regards duration of either period may be present or absent in intervarietal hybrids.

The effect of temperature on recombination was investigated. Using markers *d*, *p*, *o* and *s* (chromosome 2), it was found that the percentage of crossing over between *d* and *p* increased from 2·85 at 50° F. to 4·2 at 70° F., and between *p* and *o* from 8·6 at 50° F. to 12·1 at 70° F. The results were complicated by differences in viability of the recombinant classes; the genotypes homozygous for the recessive markers were in many cases semilethal. The diallel cross was critically assessed as a breeding method [cf. XXIX, 1306].

130 *Department of Genetics.* (*pp. 14–18*).

Self incompatibility.

Seventy-six species from 25 genera in the Solanaceae were examined. No self-incompatible species were found in *Datura*, *Capsicum* and the tribe Salpiglossideae. It is however pointed out that the breeding behaviour of the seed stocks used may not be typical of natural populations. All the self-incompatible species were diploid and all the polyploids self fertile. Of the 23 species of *Linaria* studied, 10 were self incompatible. Self-fertile and self-incompatible plants were found in 3 species while the remaining 10 were self fertile. All self-incompatible species were diploid ($2n = 12$). One self-fertile species, *L. litorale*, was hexaploid.

Coprinus lagopus.

Marker mutants, chromosome mapping and aberrant mating reactions received attention.

131 *Dodds, K. S. Department of potato genetics.* (*pp. 19–25*).

Cultivated diploids.

Only five different *S* alleles were found in five lines of *Solanum goniocalyx* from four regions in Peru. The taxonomic significance of the *S*-allelic constitution of this material is discussed. In all the lines, several pollen tubes reached the ovules after selfing. Some lines produced seeds when selfed and are to be used in a study of the breakdown in self incompatibility. *S. phureja* 'CPC979' is also being studied in the same respect. An attempt is being made to develop a fully self-compatible line by selection. About one-third of the plants in a selfed progeny from the clone gave seed on selfing. Percentage of berries set after selfing has been found to be valid as a criterion of degree of self fertility, since plants selected on this basis have given the highest proportions of self-fertile S_2 individuals. Selection has been initiated by crossing the most self-fertile S_1 plants. Not all of the crosses possible between selected plants could however be made, suggesting that ability to self is not necessarily accompanied by crossability with other members of the same incompatibility group.

Interspecific relationships.

Cytogenetical investigation of interspecific relationships in the series *Conicibaccata*, *Demissa*, *Longipedicellata* and *Piurana* continued. Crossability, chromosome pairing and fertility are being examined in all combinations of 14 species. So far, 155 of the possible 182 crosses, including reciprocals, have been attempted. Twenty-four combinations were successful. Ten F_1 plants from *S. stoloniferum* (self compatible) x *S. tuquerrense* (self incompatible) were studied in greater detail. In back crosses to *S. tuquerrense* as ♂, all F_1 plants showed fertility. In back crosses to the parental clone of *S. stoloniferum* as ♂, two plants were fertile and eight sterile. Using 29 fertile clones of *S. stoloniferum* in further crosses, it was found that each of ten hybrids had a characteristic pattern of behaviour. Studies of pollen-tube growth and seed set suggested that incompatibility and zygotic lethality were jointly responsible for the diversity.

Late blight.

In the field during the severe blight epidemic of 1958, plants with one *R* gene and plants with R_4 and one other *R* gene became infected, whereas plants with two *R* genes, neither of which was R_1, remained healthy.

Breeding has as its aim the development of varieties possessing two or three *R* genes. Seedlings with these genotypes are being selected either by exposing them while in the seed trays to infection with a mixture of the appropriate races or by testing the reaction of detached leaflets to individual races.

Using detached leaflets, resistance in seedlings of 24 lines of *S. stoloniferum* was determined. Crosses were made for the further investigation of resistance in this species.

Testing *S. tuberosum* ssp. *andigenum* for field resistance to late blight continued. No plant was more resistant than plants of British commercial varieties and only 5% were even comparable in degree of resistance. It is therefore doubtful whether development of a variety from this material would be easier than from a wild species with high resistance.

Investigations were initiated on aspects of genetic variability of the pathogen relevant to a study of field resistance as compared with *R* resistance. Observations were made on the vigour of isolates of the common race on tuber tissue, as measured by growth rate. The growth rates of several isolates differed but no isolate grew better on the variety from which it was taken than on other varieties.

An antiserum was prepared by intravenous injection of zoospores of race 1,4 into rabbits in an attempt to find antigenic types which might prove useful for genetical analysis of the pathogen. The antiserum immobilized zoospores at a dilution of 1 : 1000 and gave a sharp zone of precipitation when the gel-diffusion technique was used, but the zoospores of the isolates examined, which included nine pathogenic races, differed little in sensitivity and gave apparently identical precipitation zones. The marked effect of the antiserum on mobility suggests that the antigenic component may be associated with the flagella. This hypothesis is to be tested by preparing an antiserum by means of a mycelial preparation.

Virus Y.

In breeding, progenies derived from resistant parents were inoculated mechanically and susceptible seedlings discarded.

Comparison of methods of inoculation showed that a number of seedlings selected as resistant to mechanical inoculation were also resistant to infection by aphid vectors. Reaction of these seedlings when grafted on Y-infected tomato stocks depended on their origin. A top necrosis occurred in seedlings giving a hypersensitive response to mechanical inoculation; these had been derived from *S. demissum.* Seedlings showing an immune response to mechanical inoculation developed small necrotic lesions but the virus could not be recovered from the scions; these seedlings were derived from *S. stoloniferum.*

Crosses were made to provide material for a comparative study of the nature and inheritance of the Y resistance of different wild tuberous species.

Resistant plants of *S. chacoense, S. demissum* and *S. ehrenbergii* responded hypersensitively. Resistant plants of *S. stoloniferum* showed immunity after mechanical inoculation; many developed localized necroses when grafted on infected tomato stocks but the virus could not be recovered from the scions. Resistance in *S. rybinii* was not associated with a hypersensitive response.

An examination was made of progenies of *S. demissum* from crosses in which the parents responded in three ways to mechanical inoculation: (1) with local lesions which contained the virus, (2) with local lesions but subsequent systemic infection and (3) with mottle. The local-lesion reaction was under the control of a major gene. Ability to contain the virus was inherited and is assumed to be the result of the action of modifiers.

Virus X.

Single plants from 164 lines of ssp. *andigenum* were inoculated. Those showing mottle were discarded and the remainder tested serologically. Fifty plants had apparently remained free of infection.

Commonwealth Potato Collection.

About 100 new collections were received, most of them directly from Central America where they were collected by J. G. Hawkes [cf. 540].

Biochemistry.

A summary is given of the results of investigations on: (1) biogenetic relationships between anthocyanins and flavonol glycosides in the tuberous *Solanum* spp. and *Primula sinensis*; (2) the natural occurrence of pigments containing three sugar residues in Solanaceous plants and *Streptocarpus*; and (3) the metabolism of simple phenols in the potato, in connexion with the possibility that polyphenols, especially chlorogenic acid, play a part in resistance to disease.

132 *Department of plant cell biology.* (*pp. 26–33*).

Cytochemistry.

Measurement of the dry mass of nuclei and of whole cells in roots of *Allium cepa* by interference microscopy is in progress. Ultimately, these measurements should provide basic values to which the quantities of individual substances as estimated by other cytochemical techniques may be related.

Using bull sperm, experiments have been initiated on the effects of methods of fixation on the Sakaguchi reaction.

Incorporation of H^3-thymidine.

The effect of colchicine on utilization of labelled thymidine during chromosomal reproduction in *Vicia faba* was analysed [cf. XXIX, 120].

Further attention was given to a surprising feature of H^3-thymidine incorporation in *V. faba* roots, viz. that it occurs intensively in the nuclei of some cells beginning elongation. Drawing upon biochemical and Feulgen-photometric estimations of DNA in nuclei from different zones of *Vicia* roots as reported by other investigarors, it may be concluded that the intensive incorporation is not connected with increase in polyteny or ploidy. Intensive incorporation of P^{32} or C^{14} adenine in newly differentiated nuclei does not occur; that of thymidine must therefore result "either from its metabolic exchange or its enrichment of the DNA, an alternative which would entail a change of the base ratios and is therefore considered unlikely".

Induction of chromosomal changes.

When the chromosomes of *Luzula purpurea* ($2n = 6$) are broken by X irradiation no fragments are lost during mitosis or meiosis because of the polycentric nature of the centromere. Taking advantage of this behaviour, numerous seedlings with changed chromosome complements have been induced by treatment of inflorescences with 600 r.

133 *Descriptions of Merton fruits.* (*p. 41*).
The pear Merton Pride (Glou Morceau x William's Bon Chrétien) and cherry Merton Reward (Emperor Francis x Bedford Prolific) are described.

134 STEFANOVSKIJ, I. A.
(The organization of scientific research at universities and agricultural research institutes in the German Democratic Republic).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 10 : 132–36. [Russian].

Plant breeding at various institutes is described. Among the new varieties mentioned are polyploids of long-lived white and red clover from Quedlinburg, sweet clovers free from coumarin bred at Gülzow-Güstrow, sweet lupins from the last place and Müncheberg, and a monogerm sugar beet with high root and sugar yields from Kleinwanzleben.

Bericht über die Arbeitstagung 1957 der "Arbeitsgemeinschaft der Saatzuchtleiter" im Rahmen der "Vereinigung österreichischer Saatgutzüchter". **(Report on the 1957 meeting of the working party of the principal seed producers within the framework of the Association of Austrian Seed Producers).**
Gumpenstein 1957 : Pp. 199. (Mimeographed).

135 *Schechtner, G. Grünlandinteressen und Futterpflanzenzüchtung.* (*Pasture interests and fodder plant breeding*). (*pp. 3–27*).
The requirements in forage grasses and legumes in Austria are considered. It is suggested that breeders concentrate their efforts on those plants whose seed is in greatest demand and on those in which breeding appears most promising. In Austria red clover is in great demand and also breeding has been more successful with clovers than with grass species. The choice of breeding aims is also discussed. Stress is laid on the importance of breeding for good growing capacity and tillering. Breeding for leafiness should not be overdone for there is a danger of reducing the competitive ability of the plants.

136 *Herrmann, P. Aufbau und Systematik moderner Getreidezuchtgärten.* (*Organization and systematics of modern cereal nurseries*). (*pp. 28–50*).
Different breeding methods are discussed, 12 selection procedures being described.

137 *Schrimpf, K. Gesichtspunkte und Methoden bei der Auslese in der Weizenzüchtung.* (*Viewpoints and methods in selection in wheat breeding*). (*pp. 51–68*).
A general account is presented of methods of wheat selection, reference being made to methods that have proved successful in Germany. Stress is laid on the importance of the choice of parents in hybridization. An early separation of lines is also important.

138 *Hänsel, H. Untersuchungen über den Einfluss von Zahl der Kronenwurzeln, Halmdurchmesser und Halmlänge auf die Standfestigkeit von Winterweizen* (Triticum aestivum). [*Investigations on the influence of the number of crown roots, stem diameter and stem length on the standing capacity of winter wheat* (T. aestivum)]. (*pp. 69–95*).
Investigations conducted at Probstdorf with 21 varieties are described. The number of roots per eared stem and the basal diameter of the stem appeared to be varietal characters; the varieties with greater stem diameter also tended to have on the average a higher number of roots per stem. The resistance to breaking of the lower part of the stem was correlated with the basal diameter. There was no correlation between number of roots per eared stem and stem length but stem number and stem length showed a weak positive correlation. Stem length had more influence on standing capacity than root number per stem and stem diameter. The "lodging quotients" stem length/root number, stem length/basal diameter and (stem length + ear weight)/stem diameter were correlated with estimates of lodging: $r = +0{\cdot}63$, $+0{\cdot}67$ and $+0{\cdot}68$, respectively. It is possible to determine the potential standing capacity of a variety by comparing its lodging quotients with those of a standard. It is concluded that in selecting for lodging resistance,

short stem length and large basal diameter should be considered.

139 *Hänsel, H. Kurzmethode der Varianzanalyse nach Hartley und eine weitere Vereinfachung des Verfahrens durch direkte Bestimmung von Grenzdifferenzen.* (*The short method of variance analysis by Hartley and further simplification of the procedure by direct determination of limiting differences*). (*pp. 96–104*) .
[Cf. XXIX, 3335].

140 *Wienhues, F. Neue Gesichtspunkte zur Zuchtmethodik bei Getreide.* (*New viewpoints on breeding methods in cereals*). (*pp. 113–41*).

Difficulties encountered in the improvements of quantitative characters such as yield are surveyed. Breeding methods are also discussed and testing and selection in early generations is thought to be more useful than testing in later generations. It is pointed out that convergence breeding and back crossing are particularly valuable in breeding with highly developed varieties which already have a good combination of characters.

141 *Banga, O. Leistungsanalyse bei gartenbaulichen Kulturarten.* (*Analysis of performance in horticultural crop species*). (*pp. 142–60*).

Ways of testing varieties and assessing the value of a crop, including the use of statistical procedures, are discussed. Also methods of investigating the reaction of plants to environmental factors are described, mention being made of the phytotron.

142 *Solotarev, E. Beitrag zur Weizenqualität.* (*A contribution on wheat quality*). (*pp. 161–80*).

In this account of investigations of wheat varieties grown in various localities in Austria, data on characters affecting baking quality are provided; these characters were greatly influenced by environmental factors.

143 KARNER, L.
Ergebnisse der Sonderkulturen-Versuche des Jahres 1958. **(Results of the special crop trials of the year 1958).**
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1959 : No. 46 : Pp. 78. (Mimeographed).

The results are reported of trials in Austria of varieties of kohl rabi, poppy, sweet pepper, medicinal plants, beetroot, carrot, radish, onion, cabbage, cauliflower, spinach, lettuce, tomato, bean, peas and parsley.

Nemesített növényfajtákkal végzett országos fajtakísérletek eredményei 1957. **(Results of the national varietal trials of improved crop varieties, 1957).**
Budapest 1959 : Pp. 338.

144 *Jánossy, A. Az Országos Növényfajtakísérleti Intézet 1957. évi munkája.* (*The work of the National Institute for Crop Variety Testing in 1957*). (*pp. 3–32*).

Notes are given on the trials of cereals, potato, mangel, flax, hemp, sunflower, lucerne, pea, bean, *Capsicum*, tomato, lettuce, melon and raspberry, carried out by the above institute in Hungary. Among varieties receiving special mention are: the winter wheat Fertőd 290, a sister wheat of Fertőd 293, which has stiff straw, yields well and resists leaf rust; the winter barley Gödöllő 52, equalling or surpassing Lédeci Beta, which has hitherto yielded most; the potato Somogy 4, one of the earliest of the medium-early group, with attractive tubers and a good flavour; the new mangel K331 (Beta rosa tetra x diploid Beta 430), which competes with the best foreign varieties; the high-yielding new sweet pepper Hatvan; the lettuce Soroksár, showing marked freedom from diseases; and the raspberries E401 and Angol 1.

Other work of the station includes phytopathological studies of various crops, research on statistical methods for experiments and the addition of material to the crop variety collection.

145 *Sváb, J. Szubjektív fajtabírálat módszere nagyüzemi fajtakísérletekben.* (*A method of subjective evaluation of varieties in large-scale varietal trials*). (*pp. 50–61*).

In the large-scale trials in which varieties are tested under farm conditions throughout Hungary, the numbers of varieties tested as well as the climatic conditions vary on the different farms so that standard methods of analysis cannot be used. In the method adopted, the growers are required to evaluate subjectively such characters as cold resistance, tendency to lodge and hardiness, giving answers of one word or one number in the scale 1–5; in addition they have to compare the varieties pairwise, stating whether one is agronomically superior, inferior or equal to the other. The method described by Sandison can be applied to the data thus obtained. This involves working out the ratio of the number of farms at which a variety was the better of the two to the number at which it was the worse; the significance of the ratio may then be read off from the table provided.

146 *Hinfner, K. Rendellenes gumófejlődések az 1957. évi országos burgonya fajtakísérletekben.* (*Irregular tuber development in the 1957 national potato variety trials*). (*pp. 62–88*).

Thirty-eight varieties were examined for their tendencies towards the following types of abnormal growth: (1) formation of secondary and tertiary tubers from stolons growing from the primary tubers; (2) development of lateral secondary chains of tubers on the stolons; (3) twin tuber formation; and (4) gemmation. In the group of late varieties, the mean tendency towards the first two abnormalities was higher than in the early and medium-early groups. The first two types of aberration were associated and so were the last two, but all four types occurred together in only a few varieties.

147 *György, K. (Mrs.). A répagyökérfekély kórokozóinak országos elterjedése és a répafajták fertőzöttségének vizsgálata.* (*The distribution of the causal agent of black leg of sugar beet in Hungary and an examination of the infection of sugar-beet varieties*). (*pp. 89–96*).

The cause of black leg was found to be *Phoma betae.* None of the varieties examined proved free from infection.

148 *Papp, Zs. Őszi búza* (Triticum aestivum *f.* hybernum *L.*). [*Winter wheat* (T. aestivum *f.* hybernum *L.*)]. (*pp. 97–111*).

Details of yield, maturity period, fillering, 1000-grain weight, number and weight of grains per ear and quality are given for 13 varieties tested in different regions in Hungary. Among the six varieties not yet certified, Kompolt 169 was very productive but not good in quality, U2 gave high yields and had firm straw and Fertőd 293 was also stiff strawed and resistant to leaf rust.

149 *Horváth, P. Tavaszi árpa* (Hordeum distichon *var.* nutans *Schübl.*). [*Spring barley* (H. distichon *var.* nutans *Schübl.*)]. (*pp. 112–36*).

Thirteen varieties were tested in 1955 and 15 in 1956 and 1957 at various stations in Hungary. Data are given on their productivity, agronomic characters and quality. Martonvásár FB104 gave the best and most reliable yields, closely followed by FB102; the former is a good malting variety, the latter a fodder barley.

150 *Kapás, S. & Kelemen, I. Magyar hibridkukoricák országos kísérlete 1956–1957.* (*National trial of Hungarian maize hybrids, 1956–1957*). (*pp. 137–49*).

Five hybrids were tested in 1956 and two further hybrids in 1957, the trials being laid out at various localities. Tables showing yields and incidence of lodging and disease are presented. The medium-early hybrid Mv39 and the medium-late hybrid Mv1 both yielded well in both years, the former being adapted to all parts of the country, the latter chiefly to the south.

151 *Schüller, F. Külföldi hibridkukoricákkal végzett nagyüzemi kísérletek 1957-ben.* (*Large-scale trials of foreign maize hybrids conducted in 1957*). (*pp. 150–72*).

American and Canadian hybrids were compared with Hungarian varieties and hybrids in full-scale farm trials throughout the country. In southern regions the introduced hybrids, which were later in maturity than the Hungarian forms, were generally the most productive but in the northern and north-western parts of Transdanubia Mv5 was best.

152 *Schüller, F. & Sváb, J. (Mrs.). Nagyüzemi fajtakísérletek 1955–1957.* (*Large-scale varietal trials, 1955–57*). (*pp. 174–91*).

In full-scale farm trials conducted throughout Hungary, FB104 and FB102 were the best and most widely adapted spring barleys; Fleischmann was the best oat variety for the southern plain and Székács for northern Transdanubia; the hemp B7 slightly, but not significantly, outyielded Kompolt and Tiborszállás; and the peas Record and Victoria surpassed Express.

153 *Horváth, A. Cukorrépa* (Beta vulgaris *v.* saccharifera *Alef.*). [*Sugar beet* (B. vulgaris *v.* saccharifera *Alef.*)]. (*pp. 192–215*).

Tables showing the yields of roots and sugar and the *Cercospora* resistance of 14 varieties tested in eight localities are presented and discussed. A decline in yield of the polyploid varieties in successive years is ascribed to the difficulties of seed production and a decrease in *Cercospora* resistance.

154 *Bakos, Zs. Ricinus* (Ricinus communis *L.*). [*Castor oil plant* (R. communis *L.*)]. (*pp. 216–32*).

Of five varieties tested over four years at six localities, the early variety Iregi korai tüskenélküli [Ireg Early Spineless] gave the highest average yields of seeds. There was a marked variety x year interaction, the period from flowering to maturity being highly variable from year to year.

155 *Sváb, J.* (*Mrs.*). *Sárgavirágú édes csillagfürt* (Lupinus luteus *L.*). [*Sweet yellow lupin* (L. luteus *L.*)]. (*pp. 233–51*).

The highest seed yields among the six varieties tested in 1955–57 were given by Gyulatanya lines 784 and 911; the former also showed the lowest incidence of mosaic.

156 *Bagola, I. Tavaszi bükköny fajtakísérletek 1955–1957* (Vicia sativa *L.*). [*Spring vetch varietal trials, 1955–1957* (V. sativa *L.*)]. (*pp. 252–55*).

Four vetches tested in different localities differed little in yield of green matter but Beta 14 yielded most seed.

157 *Kelemen, I. Bíborhere* (Trifolium incarnatum *L.*). [*Crimson clover* (T. incarnatum *L.*)]. (*pp. 256–64*).

Three varieties were tested in 1953–54 and the same three and an additional variety in 1956–57. No varietal differences in yields of green matter or seed were established.

158 *Székács, J. Nemesített fűfajtáink.* (*Improved grass varieties*). (*pp. 265–90*).

Tables showing the chief characters and performance of strains of different grass species are followed by notes on the individual species and strains.

159 *Komjáti, I. Borsó* (Pisum sativum *L.*). [*Pea* (P. sativum *L.*)]. (*pp. 291–315*).

Among 23 green pea varieties tested in 1956–57, the highest yields were obtained from Kleine Rheinländerin [Little Rhinelander], Kelvedon Wonder, Onward and Little Marvel. The most productive of 11 shelling and fodder peas were Korai Viktoria [Early Victoria], Express, Record and Ireg Pl.

160 *Komjáti, I. & Gábriel, A.* (*Mrs.*). *Vöröshagyma* (Allium cepa *L.*) *1952–53–54–55.* [*Onion* (A. cepa *L.*) *1952–55*]. (*pp. 316–36*).

Eleven varieties were tested during the above period. Varieties with firm bulbs and good storage capacity do best under the dry conditions generally obtaining in Hungary.

161 Lavrova, Z.
(How valuable varieties were made).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 11 : 71–73. [Russian].

This brief account of plant breeding work at the Sokolovka breeding station, Kirov province, since 1917 lists some improved varieties of cereals and some water-melon varieties which ripen in the open and produce large fruits rich in sugar.

162 Marinič, P. E.
(Recent varietal standardization of crop plants in the USSR).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 10 : 23–32. [Russian].

Many recent Soviet standard varieties of agricultural, horticultural and industrial plants are listed. Among new high-yielding wheats is the strong-floured spring variety Saratov 29, which is resistant to lodging, shedding and loose smut. Other new varieties of cereals include the buckwheat Černigov 185, which outyields Bogatyr' [Hero], and the early-ripening rice varieties Alakul'skij and Zeravšanika 427, both resistant to lodging and shedding. Mention is made also of the new potato variety Ruta, which is resistant to *Phytophthora* and *Synchytrium*, and the new sunflower Armavir 9343, characterized by great earliness, high oil yield and resistance to *Orobanche* and *Homeosoma*.

163 Ladygin, N. D.
(At the Gor'kij Agricultural Institute).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 11 : 83–87. [Russian].

This review of the activities at the above institute since its inception in 1917 refers to breeding of agricultural and horticultural plants. The results include early ripening millets with large grain and high yields and the wart-resistant potato variety Družba [Friendship]. Mention is made of the introduction of *Roegneria* sp. which yields 50–60 c. hay per ha. and 7–10 c. seed.

164 Lupinovič, I. S.
(Achievements of agricultural science in the White Russian SSR over 40 years).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 12 : 19–31. [Russian].

Breeding of agricultural and horticultural plants and forest trees is mentioned. The results include the winter wheats Zolotistaja [Golden] and White Russian and the winter ryes Nepolegajuščaja [Lodging-resistant] and Partisan which are referred to as adapted to local growing conditions, highly productive and possessing good baking properties. Also mentioned are the following wart-resistant potato varieties bred in White Russia: Trudovoj [Labour], Agronomičeskij [Agronomic], Zven'evoj [Detachment], Skorospelka 1 [Early 1], Rusinoviči, Minsk and Pobeda [Victory].

Quick-growing forms of aspen resistant to *Ganoderma applanatum* have been selected from inferior types of aspen by their green bark.

165 Institutionen för växtodlingslära 1934–1959. **(The Institute of Plant Husbandry, 1934-1959).**
Växtodling 1959 : No. 14 : 7–38.

The work of this institute of the Royal School of Agriculture, Sweden, over the above period is summarized. The crops studied include cereals, legumes, oil crops and hybrid maize for silage.

166 Beretning om Planteforædlingsarbejdet ved Pajbjergfonden, 1958. (**Report on the plant breeding work of the Pajbjerg Foundation, 1958**). Pp. 32. (Mimeographed).

Wheat. Scandinavian wheats have been crossed with southern varieties with the aim of combining the hardiness of the former with the greater straw strength and yield of the other. Eroica x Konge [King] 69/28 is very early and stiff strawed, shows more tolerance of foot-rot diseases than other varieties and has generally given high yields of grain. Two other series of crosses involving Alba, Ministre and Jubilee, and Banco, Odin and Vakka [Bushel], respectively, have been initiated.

Oats. Marne x Minor 52/4–13, an early line with stronger straw than other varieties, shows promise. In breeding for eelworm resistance, the resistant variety Grise de Houdan [Houdan Grey] has been crossed with Rex, Staal [Steel], and Minor.

Barley. Among promising lines under study are: Maja x Kenia 40/1, Rigel x Maja 5/2 and Rigel x Balder 30, all with about the same yield as Rika but less stiff strawed, and the first mentioned showing resistance to loose smut and an ability to stand well when overripe; four lines from Herta x Ymer and two from Rigel x Balder, all similar to Rika in straw stiffness; three lines from (Rigel x Freja) x Ymer which outyield Rika and are intermediate between the latter and Drost [Lord High Constable] in straw stiffness; and Netto x Drot [King] x Freja 4 which equals Rika in stiffness and yields almost as much.

Drost and Rika have been crossed in an attempt to combine the straw stiffness of the latter with the resistance to oat nematode and loose smut of the former. Selection for smut resistance is based on plants in which the flowers do not open, since these escape infection. A few lines showing eelworm resistance and having nonopening flowers have been selected. Two races of oat nematode occur, Drost being resistant to only one, Kron [Crown] partially resistant to both and a third variety, which is undesirable in other respects, fully resistant. The resistance of the last is being transferred to Herta and to lines of Herta x Ymer. Several six-rowed lines with particularly strong straw, obtained from Juli x Rigel, have been further crossed with the two-rowed varieties Drost and Rika in an attempt to improve their yield. Populations from Drost x six-rowed barley include lines resistant to oat nematode, but only a few of these have nonopening flowers. Two-rowed lines segregating from the above crosses have very large grains and extremely stiff straw, which stands well when overripe, but give rather thin stands; they are being back crossed to Drost, Rika and Bonus. A very short and very stiff-strawed barley found in a field of Maja has also been used in a number of crosses.

Grasses. Earlier methods have been based on clonal populations of individual plant selections, but these have yielded highly variable progenies and attention has recently been directed towards the development of distinct and uniform populations derived from the self pollination of hybrids between individual plants selected for specific characters. The aim is to obtain a wide variety of pure lines on which to base further breeding. The method is being applied to ryegrass, cocksfoot, meadow fescue and timothy. A good degree of uniformity has been attained in ryegrass populations. Mention is made of several strains of each species which are undergoing or have undergone testing in the national trials. Chromosome doubling has been undertaken in ryegrass and meadow fescue.

Clover. Selection of clones free from cyanogenetic glycoside has been effected in the white clover Milka. The red clovers Pajbjerg II and Elbo, together with other varieties, have undergone selection for resistance to clover rot and eelworm. Elbo, a recent strain, includes Weibull's Resistenta, Østra Karaby, Wambåsa and Harrie in its parentage. Its colchicine-induced tetraploids equalled the diploids in the first year and surpassed them in the second. The tetraploids are being selected for resistance to clover rot and nematode and for improved seed set.

Beet. Numerous tetraploids have been developed and combined with diploids to give a large variety of different high-yielding triploids. The two triploids Korsroe P [Cross beet P] and Runkelroe Ideal P [Ideal mangel P] have shown promise in Norwegian, Swedish, Dutch and Swiss trials as well as Danish.

In breeding for bolting resistance it has been found that the tendency to bolt is greater in plants grown from seed matured in the open than in those from greenhouse-grown seed. Selection is being effected under conditions which encourage bolting. Material derived from crosses of $2n$ and $4n$ Korsroe with $2n$ and $4n$ sugar beet, back crossed to a yellow sugar-mangel, is under study. Rex has been crossed with a number of varieties, including Groenkraag CB [Green Collar CB], Bison, the sugar beet Hinderupgaard XI and some tetraploid material.

Male sterility from American sugar beets is being transferred to Danish beets, and O types for the maintenance of the male-sterile forms have been developed from Korsroe and Rex. The male-sterile lines are being used in the production of triploid seed, using tetraploid forms as pollen parent. Chromosome doubling has been induced in male-sterile and O types with a view to producing triploids from a combination of these with diploid pollen parents.

Swede. Selection for resistance to leaf diseases and club root is in progress. A Bangholm type with complete resistance to club root has been isolated from German material and is being used as a parent in crosses with Sahna progenies. Another German strain, Seefelder, has also proved highly resistant.

167 Tuinbouwkundig onderzoek. Jaarverslag 1958. (**Horticultural research. Annual report, 1958**).
Directie van de Tuinbouw en het Tuinbouwonderwijs, 's-Gravenhage : Pp. 351.

Besides the work referred to below, previous work on potato and pea [cf. XXIX, 3538] is mentioned and brief notes on progress in breeding angelica, *Atropa belladonna*, *Datura*, *Mentha* and other herbs are given.

Clover. Clover eelworm has caused damage to white clover, but some strains appear to be resistant.

Digitalis. Open pollination of tetraploid *D. lanata* by diploid *D. purpurea* yielded 19 hybrids which appear to be triploid.

Apple. No varietal differences in susceptibility to canker have been detected. Seedlings with either Cox's Orange Pippin or Jonathan as one parent have blossomed 3–12 days later than these two varieties. Medaille d'Or [Gold Medal] x Jonathan and Crawley Beauty x Cox's Orange Pippin have yielded 90 and 761 seeds respectively.

Small fruits. Among crosses of aphid-resistant raspberry selections with Malling Jewel, Schönemann and Willamette, about one third proved resistant to *Amphorophora rubi* when inoculated. Seeds have been obtained from crosses between red and black currants and between black currants and long-strigged species.

The release of the new strawberry varieties Johannes, Theodorus and Gerardus is noted.

Beetroot. Colchicine treatment has resulted in 124 tetraploids in Egyptische platronde [Egyptian Oblate], 78 in Gladoro and 143 in Gribovo. The breeding method used for this crop is that of mass family selection, involving the selection of, say, 100 good beetroots, which are allowed to flower together. Their progenies are assessed separately and, from the best few, 100 good plants are selected for the next cycle. Selection for colour has been found to be more effective in the summer during rapid growth than in autumn during slower growth. Attempts to transfer the monogerm and the male-sterile characters from sugar beet are in progress.

Carrot. Tetraploids and mixoploids have been selected from colchicine-treated material of Amsterdamse Bak [Amsterdam Forcing], Flakkeese and Nantes.

Brassica. Two fertile amphidiploid plants have been obtained from early kale ($4n$) x *Raphanus sativus* ($2n$). The cross kohl rabi x Chinese cabbage gave one plant. Tetraploid seed has been obtained from colchicine-induced tetraploids of turnip.

A cross between two very early pointed-headed cabbages gave an F_1 which was intermediate in most characters. Red cabbage is more rapidly affected by inbreeding depression than ordinary cabbage. The appearance of nonwaxiness in selections of Langendijk red cabbage is attributed to a single recessive gene.

In cauliflower, male sterility appears to be controlled by a single recessive factor and is being employed in the back-crossing programme for club-root resistance, which is governed by several genes. Firmness of the curd is apparently also determined by several factors, and whiteness by one dominant gene which is probably not linked with that for male sterility. Cauliflower x cabbage back crossed to cauliflower gave a number of F_2 plants forming small cauliflower-like heads.

There is evidence that the annual habit is dominant over the biennial in Brussels sprouts. No clear-cut segregation ratios were obtained, possibly because a late-flowering form was used as the annual parent. Outstanding quality has been found in some F_1s from crosses between inbreds.

Melon. Among the best crosses tested were Enkele Net [Single Net] x Bender's Surprise (F$_2$) and Honey Dew x Enkele Net (F$_2$); Togo x Groene Ananas [Green Pineapple] (F$_1$) also made a good impression.

Cucumber. Seedlings of the American selection Barnes 197087 were completely susceptible to *Colletotrichum lagenarium* (*Glomerella lagenaria*) at 17° C., partially susceptible at 20° C. and highly resistant at 23° C. At all these temperatures Baarlose Nietplekker was susceptible. Two further American selections, PI 200815 and 200818, proved resistant to mildew but susceptible to mosaic. A method of selecting for freedom from bitterness has been developed [cf. XXIX, 4577]. Resistance to *Corynespora melonis* appears to be determined by a single gene [cf. XXVIII, 4834]. A cucumber from Indonesia proved free from mildew except on its cotyledons; Ashley Sc10–13 and L27 have also shown little attack.

Tomato. Nineteen different sterile mutants and 22 other mutant forms have been identified among 50 lines from neutron-irradiated Ailsa Craig; all the mutations investigated were monogenic. Resistance to corky root appears, from the cross *Lycopersicon esculentum* x *L. hirsutum*, to depend on two factors; resistance has also been found in the back cross to tomato. A few F$_2$ and F$_3$ plants from *L. esculentum* x *L. glandulosum* combine resistance with desirable fruit type.

Phaseolus. Testing of *Ph. vulgaris* x *Ph. dumosus* for resistance to *Colletotrichum* and viruses continued. The F$_1$ of *Ph. vulgaris* 'Combine' x *Ph. dumosus* has been back crossed to different dwarf and climbing beans. *Ph. coccineus* 'Emergo' crossed with a climbing French bean for slicing gave a normal F$_1$ with Emergo dominant in leaf form and flowering; crossed with climbing snap bean it yielded stunted plants with malformed leaves and few seeds; and crossed with dwarf snap or slicing beans it gave few viable plants, most of which produced inviable seeds.

Pea. At Wageningen, neutron irradiation has induced three recessive mutations and one dominant, the last, previously unknown, characterized by spatulate stipules.

168 Les recherches scientifiques en agriculture. Période 1947–1956. **(Scientific research in agriculture. Period 1947-1956).**
Minist. Agric., Bruxelles undated : **2** : Pp. 471.

Part of this report has already been summarized [cf. XXIX, 3451]. Other sections provide brief reviews of breeding of root crops, hops, forest trees, fruits and vegetables in Belgium.

169 Kokolios, B.
(Improved varieties of wheat, barley, oats, maize and rice and their multiplication during 1931-57).
Thessaloniki 1958 : Pp. 59. [Greek].

Descriptions are given of maize hybrids and improved varieties of wheat, oats, barley and rice distributed in Greece.

170 **Administration Report of the Director of Agriculture for 1957. Part IV—education, science and art (C).**
Dep. Agric. Ceylon 1958 : Pp. 86.

Sorghum. The dwarf type Combine Black Kafir is being crossed with the open-panicled varieties Co.2, Co.3, San pyaung and AS475 with a view to producing bird-resistant material.

Rice. Several thousand F$_3$–F$_8$ hybrid progenies were subjected to selection at eight stations. The most outstanding selections were secured from Murungakayan 302 x Mas, being notable for their high yield, short straw and resistance to iron and sulphide toxicity. Selection H–501 (GEB–24 x VI28061) has given a good performance for several seasons at Labuduwa and was released for the Galle district. Honderawala 502 was released for the Kalutara district. The development of two especially promising hybrid selections, H–4 and H–5, at the Central Rice Breeding Station, Batalogoda, is also reported. High yielding in both seasons of rice cultivation, H–4 shows a marked response to fertilizers. Short strawed and resistant to lodging and shedding, it is suitable for mechanized harvesting. It bears grain of high quality, with a milling outturn of 70%. H–5 also gives high yields in both seasons and in its advantages is largely similar to H–4.

Tomato. *Lycopersicon pimpinellifolium* is being used as a bacterial-wilt resistant parent.

Proceedings of the Ninth Pakistan Science Conference, Peshawar, 1957 : Part III Abstracts : Pp. 147.

171 *Wahhab, A., Fateh Muhammad & Mukhtar Ahmad. Soil salinity conditions and growth of crops. I. Salt tolerance of some wheat varieties at the seed germination stage. II. Salt tolerance of some varieties of cotton at the seed germination stage. III. Comparative salt tolerance of two varieties of maize. (pp. 2–3).*

Varietal differences in salt tolerance in wheat, cotton and maize are noted.

172 *Abdul Latif & Muhammad Afzal Khan. Comparative susceptibility of nine new varieties of sugarcane to the attack of borers.* (*pp. 9–10*).

Nine vareties developed at Lyallpur were tested for reaction to borers. Co. L51 was the least susceptible, with only 3·3% of the tillers damaged.

173 *Abdul Hameed Khan, Mehboob Ali & Abdul Majid. III. Breeding of long staple varieties of cotton and their field performance at Lyallpur.* (*p. 15*).

The new long-stapled variety AC134 is suitable as a substitute for the present commercial standard LSS, on account of superiority in yield and quality.

174 *Abdul Hameed Khan, Nazir Ahmad & Dost Mohammad Malik. III. Studies in oil content of breeding material at Lyallpur.* (*p. 18*).

The considerable variability in oil content found in breeding material of the cottons LSS and 4F offers scope for developing improved strains. The highest oil percentages reached were respectively 26·72 and 24·27.

175 *Abdul Hameed Khan, Nazir Ahmad & Manzoor Ahmad Khan. Behaviour of some new strains of* G. hirsutum *at Gujranwala.* (*p. 18*).

Because of their very early maturity, 320F and AC158 are more suitable for the Gujranwala district than LSS.

176 *Abdul Hameed Khan & Nazir Ahmad. Improvement of cotton in lower Jhelum Canal Colony.* (*p. 19*).

AC158 was among the strains showing promise.

177 *Abdul Hameed Khan, Manzoor Ahmad Khan & Nazir Ahmad. Breeding of high yielding, short stapled new strains of* G. arboreum *for Gujranwala areas.* (*p. 19*).

New strains of the Rosea type, such as 231R, have surpassed 39 Mollisoni in yield and ginning outturn.

178 *Musahib-ud-Din Khan & Jalis, A. Interrelationship of some morphological plant characters with seed yield in coriander, fennel and bishop's weed.* (*pp. 22–23*).

Increase in seed yield was associated with increase in number of primary branches and plant weight in the above three crops. The significance of this finding to the breeder is stressed.

179 *Eunus, A. M. & Jabbar, M. A. Genetics of* Corchorus *species. I. Inheritance of flowering. II. Inheritance of branching and stipule characters.* (*p. 25*).

In work on *C. capsularis*, data from a cross between the early-flowering variety Japan and late D154 showed that late flowering was dominant over early, time of flowering being under the control of two pairs of genes. In Brazil (nonbranching with foliaceous stipules) x D154 (branching with nonfoliaceous stipules), branching was dominant and dependent on a single gene, while foliaceous stipules were dominant, stipule type being governed by two pairs of genes.

180 *Islam, A. S. & Memon, K. A. Interspecific crosses in the genus* Corchorus: *I.* Corchorus olitorius *L. x* C. depressus *C. Christensen* (= C. antichorus *Raeusch*). (*pp. 40–41*).

The decumbent habit of *C. depressus* was dominant in the F_1. All the F_1 plants were fertile and produced viable seeds.

181 *Islam, A. S. & Baig, N. A. Interspecific crosses in the genus* Corchorus: *II.* Corchorus capsularis *L. x* C. depressus *C. Christensen III.* Corchorus capsularis *L. x* C. trilocularis *L.* (*p. 41*).

The decumbent habit of *C. depressus* behaved as a recessive character in the F_1, in contrast to its behaviour in the cross with *C. olitorius*.

Reciprocal crosses were made between *C. capsularis* 'D154' and the desert weed *C. trilocularis* with a view to developing varieties for arid conditions and to study the relationships between the two species. Fruit set was higher with *C. capsularis* as ♀.

182 *Islam, A. S. & Memon, K. A. Interspecific crosses in the genus* Corchorus. *IV.* C. olitorius *L. x* C. trilocularis *L. V. Interspecific crosses between* C. olitorius *L. and* C. capsularis *L. through* C. depressus *C. Christensen* (= C. antichorus *Raeusch*). (*pp. 42–43*).

The attempt to cross *C. olitorius* and *C. trilocularis* failed, even with the application of a growth substance.

Hybrids producing viable seeds were obtained from F_1 (*C. capsularis* x *C. depressus*) x F_1 (*C. olitorius* x *C. depressus*).

183 *Islam, A. S. & Matinuddin Khan. Interspecific cross in the genus* Corchorus. *VI.* C. aestuans *L.* (C. acutangulus *Lamk*) *x* C. olitorius *and* C. aestuans *L. x* C. capsularis *L.*). (*p. 43*).

The cross *C. aestuans* x *C. olitorius* succeeded but the reciprocal and crosses in both directions of *C. capsularis* x *C. aestuans* failed.

184 *Aziz, M. A. & Nurullah, M. Some morphological characters in relation to lodging in wheat. (pp. 58–59).*

It is reported that a study has been made of the relationships of morphological characters to lodging in 20 varieties at the Agricultural College, Lyallpur, with a view to facilitating selection for resistance.

The anatomical investigation indicated that susceptibility to lodging had (1) no significant relationship with number of sclerenchyma layers, (2) a negative and highly significant association with the thickness of the sclerenchyma, (3) a negative and nonsignificant but fairly high correlation with total thickness of the culm wall and (4) a positive and highly significant relationship with size of the parenchymatous cells in the cortex.

185 **Regional research programmes 1958/1959 of the East Africa High Commission. Agriculture, animal industry, animal disease, forestry.** 1958 : Pp. 83.

Information on projects on crop breeding and genetics in progress in East Africa is included.

186 **Annual Report of the East African Agricultural and Fisheries Research Council, 1958** (1959) : Pp. 53.

Maize. The value of the Brieger method to produce a balanced heterotic population based on local varieties is being explored at the Eldoret substation. The results so far suggest that application of the technique has not resulted in any outstandingly good stocks.

Lines resistant to streak virus have been isolated at Amani from varieties from the Union of South Africa and crossed with local maizes in the hope of transferring genes for resistance to the latter. A number of lines resistant to *Puccinia polysora* are in hand so that, should a new race arise, a search may be made for genes conferring resistance to this race.

Sorghum. The breeding project recently initiated at Serere, Uganda, consists of two main lines: (1) breeding for resistance to diseases and pests, using a wide range of sorghums and related species from both within and outside East Africa as sources of resistance, and (2) production of tetraploid sorghum.

Cassava. The programme based on incorporating resistance to mosaic and brown streak from species other than *Manihot utilissima* has been brought to a close, as any appreciable improvement over the best of the present clones is likely to require a much larger and longer-term project than is considered justified. Most of the best clones developed through this work have already been distributed for trials or commercial use in East Africa, but seedlings from the most recent crosses are still under test at Amani.

187 **Annual report of the Department of Agricultural Research, Federation of Nigeria, for the year 1957-58.** 1959 : Pp. 43.

Maize. The work of the West African Maize Research Unit is summarized [cf. 334].

Rice. The results of trials of varieties and selections for suitability to various conditions are summarized. In the hope of combining the floating habit and flood resistance of *Oryza glaberrima* with the grain characters of *O. sativa*, hybridization between the two species was attempted. The percentage seed set was very low, a total of only 30 seeds being obtained from five crosses; all the seeds failed to germinate. Even allowing for deficiencies of technique, an appreciable degree of interspecific sterility seems likely.

Sweet potato. Aims in breeding comprise (1) improvement in yield, (2) resistance to pests and diseases, particularly weevil and virus, and (3) the production of a variety with the wet type of tuber preferred by local consumers. The results of several hundred self and cross pollinations revealed that complete self sterility within a variety and some degree of intervarietal incompatibility may occur.

Cassava. Further pollinations were made with the following objectives: (1) production of *Manihot glaziovii* x *M. utilissima* hybrids for selection for mosaic resistance, followed by back crossing to cassava to combine resistance with high yield; (2) selfing and back crossing interspecific hybrids from Amani to cassava, to investigate the inheritance of mosaic resistance and to combine this character with high yield; and (3) "interspecies hybridization within the species *utilissima* to produce high-yielding mosaic-tolerant clones for crossing with the interspecies hybrids, and to investigate the inheritance of variety characters in cassava." Acquisitions originating from *M. glaziovii* x *M. utilissima* crosses have given the highest percentage of mosaic-resistant types. Of the seedlings from a hybrid in the third back-cross generation to cassava, 75% have so far shown resistance. *M. melanobasis* x *M. utilissima* hybrids yielded the lowest percentage of mosaic-resistant types.

Cola. Individual-tree recording was continued in families of interspecific hybrids of *C. nitida* in Moor Plantation. Red-nut hybrids derived from crosses between pink and red nut parents again constituted the group giving the highest yield. As indicated by selfing and back crossing, white-nut trees arising through selfing or crossing white-nut parents are pure breeding for white nuts while pink-nut hybrids obtained by selfing or crossing pink-nut parents breed true for pink colour. Attempts to self hybrid red-nut trees produced by crossing two red-nut parents failed, support thus being given to the hypothesis that trees with this type of nut are self incompatible. Crosses between hybrid trees provided further evidence that cotyledon colour is controlled by at least two pairs of epistatic genes.

188 **Annual Report of the Department of Agriculture, Uganda Protectorate, for the year ended 31st December, 1957** : Pp. 56.

Maize. Resistance to *Puccinia polysora* has been transferred from two South American varieties, AFRO24 and AFRO29, to the varieties Muratha and K8. In an attempt to shorten the maturation period of Muratha, it has been crossed with the early-maturing variety K8. Selection for resistance to *Helminthosporium turcicum* (*Trichometasphaeria turcica*) has begun.

Eleusine. Selections have been made for early seed ripening, stiffness of straw and easily removable pericarp. *E. africana* is a tetraploid while the smaller *E. indica* is a diploid.

Sorghum. Breeding for bird, mirid and weevil resistance has begun in the sweet, large-glumed varieties.

Coffee. Results of controlled pollinations of the Robusta type were an average set of 47% for cross pollinations and 25% for self pollinations, the latter result being higher than expected. At medium and low altitudes, the Arabica Kenya variety K7 was found to have the greatest *Hemileia* rust resistance and retained its canopy better than other varieties. This variety and the Tanganyika varieties KP162, KP423, N39 and C40 were the highest yielders.

Annual Report of the Department of Agriculture, Colony and Protectorate of Kenya for 1957. Volume II—Record of investigations. 1959 : Pp. 157.

189 *Thorpe, H. C. Annual Report of the Senior Plant Breeder, 1957. (pp. 25–32).*

Wheat. Breeding for rust resistance at Njoro is being put on the basis of a still wider range of imported parents, including intergeneric hybrids. The Kenya varieties now being used in crossing are 261R, 184P, 360H, 294M, 354P, 356A, 358AA and Equator. In addition, Canadian Regent and Ceres R64 are being utilized as parents for improving baking quality. Seven varieties were released for 1958 [cf. XXIX, 252]. Three new races of stem rust were identified, bringing the total number now recognized in East Africa to 19.

Maize. Work on the production of synthetics continued at Njoro and Kitale. Kitale Synthetic I, developed from a "Kenya flat white" type, was released.

Earliness is one of the characters being sought at Machakos. Two varieties from Tanganyika, Taboran and Read's Early, have shown suitability in this respect. They are under trial prior to their possible release and are also being used as parents.

Multiplication of the first stock resistant to *Puccinia polysora* was undertaken in the coastal region. It was derived from straight crosses of local maize to Central American material containing *Rpp* 1 and *Rpp* 2 for resistance.

190 *Kroll, U. Annual Report of the Senior Pyrethrum Officer, 1957. (pp. 90–97).*

Single-plant selection and production of hybrids through crossing in isolated plots continued [cf. XXIX, 3004]. Apart from older varieties such as 100A, C43, C51, C79, C92, M11, M15, O1 and O4, a number of the newer hybrids showed promise in several trials.

191 **Annual Report of the Department of Agriculture of Tanganyika 1957** (1958) : Pt. II : Pp. 85.

Sorghum. In work on developing early-maturing varieties with high-quality, weevil-resistant grain at Ukiriguru, line 42B is surpassing SUK1 in yield but does not thresh as cleanly as required [cf. XXVIII, 3933]. Selections were therefore made in the attempt to overcome this defect. The back cross BC27(2) x Msumbiji has yielded lines promising in head size and grain characters but somewhat later in maturing than desirable. The best of these free-threshing lines were crossed with SUK1 and 42B. A large number of selections were taken from the back cross Dobbs (2) x Wiru. Many had good grain and panicle characters. Lines from Oklahoma 44/14 x Kahili and Ng'holongo (2) x BC27 were retained, in the case of the latter cross for further back crossing to Ng'holongo. Intercrossing of early-maturing lines of different origins continued. The most promising material is coming from BC 2W42B x (Oklahoma x Kahili), BC 2W36D x (Oklahoma x Kahili) and intercrosses of these two combinations.

In breeding for resistance to bird attack, lines combining good grains and goose-neck (inverted head) and others combining good grains with large glumes have been developed as breeding material. As previously reported, the possibility of introducing the long, strong awns of *Sorghum purpureo-sericeum* into cultivated sorghum is being explored. Plants of this species with colchicine-doubled chromosome number were crossed with diploid and tetraploid grain sorghums but it is not yet certain whether the crosses succeeded.

The results so far obtained from tetraploid sorghum suggest that satisfactory lines with a high seed set may be readily produced by intercrossing and selection, particularly if types producing two or three grains per spikelet are used. The increased fertility resulting from intercrossing tetraploid lines is associated with increase in number of bivalents.

Work on the development of lines resistant to *Striga* spp., using Dobbs as the source of resistance, is giving encouraging results.

Cotton. Breeding at Ukiriguru was concerned with (1) straight selection and testing of local material and (2) incorporation of bacterial-blight resistance into standard Ukiriguru strains [cf. 4099]. Developed at Ilonga, the multiline issue I158 is being increased to replace 47/10. It has given much higher yields than 47/10 and shown a superiority in ginning outturn of 2% [cf. 4101].

Castor oil plant. Breeding was initiated at Ilonga, to develop short-term varieties for peasant cultivation and short-term dwarf varieties for mechanized harvesting. High oil content, nonshattering and insect tolerance are among the characters sought in both cases. Selection within varieties and hybridization are under way.

Sesame. Breeding to produce a nonshattering, high-yielding variety has been undertaken at Nachingwea. It is expected that transference of the character of nonshattering will not be easy. About 20 crosses were made involving local sesame, South American varieties and Rio and Palmetto from the USA.

Sunflower. Work on synthetics derived from inbreds of West Nile continued [cf. XXVIII, 3833]. Syn. I and II from S_1 and S_2 lines respectively did not differ significantly in yield from parental West Nile.

Soya bean. Breeding to produce types suitable for mechanical harvesting and others for hand harvesting continued at Nachingwea [cf. *loc. cit.*]. Of the F_4 material studied, MIS28EB x R184 showed promise in yield and Hernon 237 x Light Speckled in plant habit. Crosses were made in the hope of combining the large seeds of Venezuela and Toro with the high yield of Hernon 237 and Malaya.

192 **Report of the Secretary to the Federal Ministry of Agriculture, Federation of Rhodesia and Nyasaland, for the year ended 30th September, 1957**
(1958) : Pp. 178.

Wheat. Breeding for rust resistance has been initiated.

Maize. By means of tests of specific combining ability with the single hybrid N3–1–4–9 x A5–7–6 at the Salisbury Experiment Station, inbreds have been chosen to replace lines used at present in producing commercial double hybrids. In addition to better combining ability, the new lines have other desirable features, such as resistance to *Helminthosporium turcicum* (*Trichometasphaeria turcica*). Production of various types of hybrids is receiving attention at the Matopos Research Station.

Potato. Selection for late-blight resistance is under way.

Cotton. [Cf. XXIX, 4107].

193 **Agricultural Experiment Station, Salisbury. Annual Report of experiments: season 1957/58.**
Rhod. agric. J. 1958 : **55** : 603–25.

Wheat. The first crosses have reached the F_5 and F_6. An American introduction, Yaktana, has been used as a parent in many new crosses.

Maize. Although hybrids have been commercially available for several years, they are all fairly similar in type, 10–14 days earlier ripening than Hickory King and susceptible to *Helminthosporium turcicum* (*Trichometasphaeria turcica*). Breeding has now reached the stage at which it is expected that these hybrids will be replaced within the next two or three years by a new and wider range of hybrids, with improved resistance to leaf blight and varying in the time taken to attain maturity.

194 **Progress Report of the Experimental Farm, Fredericton, New Brunswick 1953-1957** : Pp. 46.

Oats. Fundy was licensed in 1957 [cf. XXVII, 1657].

Potato. Information is given on the new varieties Huron (Hindenburg x Sebago) [cf. XXVIII, 1297], Fundy and Avon. Developed from USDA96–56 x Keswick, Fundy is outstanding for its earliness combined with smooth tubers and high cooking quality. Avon was derived from USDA96–56 x 1464–26, Katahdin, Majestic and Irish Cobbler being among the parents entering in the pedigree of 1464–26. Slightly earlier than Green Mountain and Katahdin in New Brunswick in yield, it has shown superiority to Katahdin and inferiority to Green Mountain. It is high in boiling and baking quality, suitable for crisp manufacture and scab resistant. Both Fundy and Avon are resistant (R_1) to the common race of late blight, susceptible to viruses X, Y and A and top necrotic to virus B.

Seedling F4724 (USDA96–56 x Sebago) offers a better source of scab resistance than Hindenburg, Richter's Jubel and Arnica since it is without their defects of susceptibility to internal necrosis and low yielding ability.

Hindenburg, Richter's Jubel, USDA96–56, USDA46952 and President entered frequently into the parentage of seedlings showing field resistance to race 1,3,4 of late blight. The problem of the effect of maturity upon late-blight reaction in testing for field resistance received attention. Seedlings up to commercial standard having two or three R genes for resistance are under observation. Seedlings carrying R_1, R_2, R_3 and R_4 have been produced from crosses between commercial-type seedlings but are still at the small-tuber stage in the greenhouse.

Raspberry. Promising seedlings were selected from crosses of Ottawa with Madawaska, Muskoka, Rideau, Trent and Tweed.

195 **Progress Report of the Experimental Farm, Morden, Manitoba 1947-1954** (1956) : Pp. 64.

In addition to the work reported below, variety trials of the following are reported: brome grass, *Elymus*, potato, pear, apricot, plum, gooseberry, strawberry and currant.

Wheat. Selkirk, a variety resistant to stem rust, was obtained by back crossing Redman to McMurachy x Exchange; it is high yielding and equal to Redman in milling and baking quality. Lee, from Hope x Timstein, is also resistant to leaf rust and all races of stem rust except 15B, but is susceptible to loose smut. Of the durum wheats, DT137 and DT136 are resistant to race 15B of stem rust, and have yielded well. Sentry is a new variety which has some tolerance of race 15B.

Oats. The varieties Garry 27 and Rodney are resistant to common forms of stem rust and smut, but the latter is susceptible to a newly identified race of stem rust, 7A. Garry 27 is earlier than Rodney, higher yielding, and more resistant to lodging and crown rust.

Maize. The objective in breeding is the production of early-maturing hybrids, increased ear height, absence of tillering, strong stems suitable for mechanical harvesting, and smut resistance. Performance data for five hybrids compared with the variety Falconer are given. Morden 74, a flint-dent of (WD x ND255) (15 x 38) pedigree, and Morden 77, a full dent with (WD x ND255) (A116 x V3) pedigree, are the most highly recommended hybrids; Morden 74 is the best yielding although its tillering and stem strength are not altogether satisfactory. In silage tests, Rainbow Flint outyielded all other varieties.

Barley. Varieties OAC21 and Montcalm are recommended for malting, and two new hybrid selections, Br3833 and UM570, have shown promise. Vantage and Husky are recommended as fodder barleys, the latter being well adapted to Manitoba conditions and slightly outyielding the former.

Lucerne. Grimm has been the highest yielding variety, but closely followed by Rhizoma, Ladak and Ferax.

Flax. Varieties Raja and Marine are both resistant to rust, and although lower yielding than some others have the advantage of maturing earlier.

Red pepper. The attempt to produce an early, dwarf high-yielding type has produced Morgold, derived from a multiple cross involving Harris Earliest, Merrimac Wonder and King of the North.

Sunflower. The hybrid Advance is grown almost exclusively; it originated as a natural top cross between inbred S–37–388 and Sunrise. Second generation Advance is lower yielding and means of increasing the yield of hybrid seed are being developed. Breeding for rust resistance has resulted in the development of Beacon, which derives its resistance from a single plant with Texas Wild Annual parentage, designated 953–88.

Attempts are being made to transfer rust resistance to the parents of Advance. Some promising results have also been obtained in the production of high yielding, early, dwarf types with high oil content.

Apple. A list is given of varieties obtained originally from open pollinated seed in 1916 selected for hardiness and quality.

Russian varieties have been evaluated in performance studies with a view to their usefulness as parent varieties. Anisim, Antonovka, Patten Greening and Tetofsky are noteworthy.

Hybridization experiments, both interspecific and intervarietal, have led to the following new introductions: M–340 (Rosilda x Angus), named Toba; M–347 (Martha x Dolgo); and M–352 (Dolgo x Harrison), named Kerr.

Sour cherry. Seedlings of the Mongolian cherry *Prunus fruticosa* have shown sufficient hardiness for cultivation in the Canadian prairie, and seven have been selected and used for crossing with commercial varieties such as Montmorency, Early Richmond, and Wragg. Results indicate full compatibility and it is hoped to produce hardy varieties of high quality.

Raspberry. Hybridization of varieties Chief and Indian Summer has resulted in the selection of nine seedlings with introduction numbers M-531—M-538 and M-541—M-543.

Cabbage. The best early-maturing, dwarf variety produced is Morden Midget, maturing in July and having heads which remain firm throughout the season.

Rhubarb. Inbreeding of the varieties Macdonald and Canada Red, which are resistant to red leaf disease, has led to the development of strong seedlings, among which hybridization to produce improved strains is envisaged.

Musk melon. The discovery of the monecious flowering habit in an early large-fruited variety has led to the development of an interesting F_1 hybrid.

Cucumber. Morden Early is an early garden variety, and Morcrop hybrid is a wilt-resistant pickling variety. Bush forms of cucumber are being developed.

Tomato. Breeding work has been directed at the production of dwarf stature, earliness and high yield. The most successful are Monarch, an F_1 hybrid from Early Chatham x Bounty; Mustang, an F_1 bush variety from Bounty x Redskin; and Meteor, an open-pollinated variety obtained by back crossing (Earlinorth x Bonton) with Bonton.

Soya bean. Kabott remains the best yielding variety which matures consistently; Acme is almost equal in yield and somewhat earlier, and more resistant to lodging. Both these have the disadvantage of low pods, which is overcome in Flambeau, but in this case the advantage is frequently offset by lodging.

Pea. Pea breeding is directed at the development of sturdy, wind-resistant varieties. Tiny Tim is an extreme dwarf form with high yield.

196 **82nd Annual Report of the Ontario Agricultural College and Experimental Farm, 1957** (1958) : Pp. 85.

Winter wheat. A new red variety, Kent, was released, resistant to smut and leaf rust.

Barley. Fertility studies have been made on artificially induced tetraploids. A large number of these have abnormal chromosome numbers, but differences in fertility among tetraploid strains cannot be completely explained by chromosome aberrations.

A new variety, York, was released which is resistant to mildew and stem rust.

Carrot. Of 11 varieties, Nantes Select was the most productive, but Nantes Special Long had longer roots.

Onion. Autumn Spice outyielded all other varieties tested. Highlight and Hybrid 45447 were the most promising alternatives.

Cabbage. Early Round was the earliest variety tested and Pennstate Ballhead the most satisfactory late variety. Selection 1922–55 was late and highly resistant to club root.

Cauliflower. Summer Harvest was the earliest and best variety tested.

Rhubarb. Irradiation of seed of the variety Valentine with X rays and thermal neutrons significantly increased the mortality of the seedlings.

Lettuce. Great Lakes 6599 was the one variety worthy of further trial.

Celery. Utah 16–11 was outstanding, particularly in resistance to internal petiole darkening during storage.

Cucumber. The production of lines with low seed content has been promoted by colchicine treatment.

Tomato. Rhode Island Early TS is an extra early variety suitable for canning. Mammoth Wonder had fruits of outstanding size, resistant to cracking, and quick to mature. The use of polyethylene mulch improved the yield of Fireball more than that of Harrow or Moreton Hybrid. Studies were made of the reaction to light intensity of different genotypes of Xanthophyllous, a yellow-leaved variety. The use of male sterility in hybridization is being studied.

Sweet corn. Early varieties suitable for processing were Carmelcross, Golden Cross Bantam, Sunrise and Golden Beauty. NK–199 had extra deep kernels and good yield.

197 **Annual Report of the Minister of Agriculture for Canada for the year ended March 31, 1958.** Pp. 144.

Microbial genetics.

Investigations on *Xanthomonas phaseoli* [cf. XXVIII, 2667] indicated that (1) this pathogen has about the same degree of spontaneous mutability as bacteria of medical importance and (2) numerous minor changes may occur in its genetic constitution without affecting its ability to cause disease in bean.

Cytochemistry.

Using embryos from dried peas, the first mass isolation of nucleoli from plant tissue was accomplished. Electron micrographs revealed a remarkable preservation of internal structure. Determinations of several chemical constituents were made. Information was obtained from lily anthers regarding the manner in which DNA is formed from soluble precursors.

Wheat. Plants for establishing a collection of special breeding stocks of spring wheat at Winnipeg were completed. The collection is designed to provide the basic germ plasm necessary to overcome any problem which can be solved by breeding. In addition, stocks are to be synthesized. The stem-rust resistance of Kenya Farmer ($2n = 42$) has been transferred to *Triticum durum*. The new source of resistance is being used to incorporate this character into durum varieties suitable for western Canada.

The soft red winter wheat Kent was licensed [cf. XXVIII, 289].

A laboratory test involving hardening and freezing of sprouted seeds has been developed which will facilitate screening of a large number of winter-wheat varieties for hardiness in a limited space. Relative ability to resist cold may be determined by this method in 8 weeks, whereas to obtain similar information in the field would require tests in several localities for a number of years.

The sedimentation and expansion tests have proved to be equally satisfactory in evaluating hybrids for baking strength at an early stage in breeding.

Lines promising with respect to resistance to common root rot (*Cochliobolus sativus*) were obtained. The fungus was subjected to genetical investigation.

Work was continued on the biochemical and biological properties of the toxin produced by *C. cochliobolus*. Its structure and molecular weight were investigated. The toxin was non-specific in its action and induced a premature senescence, rendering the plant susceptible to invasion. This information was applied to the problem of breeding for resistance.

In work on stem sawfly, solid-stemmed resistant and hollow-stemmed varieties did not differ in the nitrogen, moisture and total carbohydrate contents of the pith.

Oats. The transference of genes from diploid species to cultivated oats by means of intermediary hybrids is receiving attention.

Gene *E* governing resistance to races 1, 3, 4 and 11 of stem rust in Jostrain also conditions a mesothetic reaction to a new race, 13A. The only other known source of resistance to 13A is *Avena strigosa*.

Glen was licensed [cf. XXVII, 3880].

The search for sources of resistance to *Septoria* (*Leptosphaeria*) leaf blotch yielded some relatively tolerant selections, which were used in crosses.

Maize. It was confirmed that resistance to *Fusarium* root and stalk rot may be transmitted to single hybrids by crossing susceptible inbreds with the resistant inbred CM9*. All plants of the cross between the resistant inbreds B14 and CH9 were resistant, even late in the season. This single cross may prove valuable as a parent in the production of resistant double hybrids for commercial use.

Barley. The fodder variety Nord was distributed in northern Ontario and north-western Quebec [cf. XXVIII, 207]. Varieties likely to prove useful as sources of a high degree of resistance to scald were discovered.

Perennial ryegrass. Norlea, capable of surviving winters throughout extensive areas in eastern Canada as well as in British Columbia, was distributed [cf. XXVIII, 4288].

Lucerne. Five synthetics resistant to bacterial wilt were developed in southern Alberta.

Red clover. At least some plants of self-sterile tetraploid red clover may be induced to set selfed seed by mixing low concentrations of certain plant hormones with the pollen. The two most effective hormones were 2,4-5 trichlorophenoxy-propionic acid and p-chlorophenoxy-acetic acid.

Sweet clover. The coumarin-free variety Cumino has been developed [cf. XXVIII, 4349]. It equals Arctic in hardiness, vigour and seed yield.

Potato. Developed at Fredericton, F503 is an early, late-blight resistant seedling with high yield and good cooking quality. Its introduction in the near future is under consideration.

Isolations of *Phytophthora infestans* from wild *Solanum* species from Mexico represented races known to occur in Canada and the USA, but also some races which could not be identified. Races 0 and 4 were found on a wild potato (unspecified) south of Mexico City. A few

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* ? = CH9

Canadian selections from hybrids between the cultivated potato and this wild species survived after a season's exposure to a severe epidemic in a high valley in Mexico, under conditions regarded as the most severe found anywhere in the Americas. Extensive collections were made among the group of Mexican diploid species which had not been used in breeding programmes. A high degree of resistance was noted in certain clones of each species. All the species were self sterile but set seed when cross pollinated. In studies in New Brunswick, application of 2,4-D to the ovary resulted in good seed production in some wide crosses.

Tobacco. A total sugar-nicotine ratio of 10 is characteristic of good quality in flue-cured tobacco. Thick-leaved hybrid derivatives showed more resistance to weather fleck than thin-leaved. Harrow 38, a cigarette burley type resistant to black root rot and brown root rot and maturing 7–10 days earlier than the present commercial resistant varieties, has reached the final stage of testing. Breeding is in progress at Ottawa to produce cigar tobaccos with mild smoke and high yield. Some low-nicotine strains gave a more satisfactory smoke than high-nicotine ones. Low-nicotine plants were therefore selected for further processing.

Linseed. Iodine number has not proved to be such a satisfactory indication of drying quality of the oil as the unsaturated acid fractions. The rank attained by a variety for these fractions in one environment was fairly well maintained in another.

Tree fruits. Progress has been made in the application of electrical-conductivity tests as a means of evaluating seedlings of tree fruits for winter hardiness.

In inoculation tests of over 4000 apple seedlings to scab in Ontario, 7·6% were rated as resistant or immune and saved for field tests.

Strawberry. Four Ottawa introductions were named Cavalier, Grenadier, Guardsman and Redcoat. Cavalier and Guardsman may be especially useful as varieties early and late in ripening, respectively. Redcoat has compared favourably in yield and quality with standard varieties in Quebec, Ontario, the Maritime Provinces and British Columbia. Selections from Saanichton, resistant to at least one strain of red core, were released for trial by growers.

Tomato. X-ray induction of a mutation for resistance to a virulent race of blight other than the common one is being attempted.

Pea. In field-pea breeding, Stirling is being utilized as a source of resistance to *Ascochyta* blight.

198 **Research in the service of Maryland agriculture. Seventieth Annual Report, 1956-1957.**
Bull. Md. agric. Exp. Sta. 1958 : No. A–92 : Pp. 89.

Cereals. Breeding for resistance to mildew in wheat and barley and study of the inheritance of this character are in progress.

Cocksfoot. Promising late-maturing strains to be used primarily with lucerne for hay are to be further tested.

Clover. The red clover Chesapeake is being released [cf. XXVIII, 4335]. Breeding is under way to combine the characteristics of superior local strains with the southern-anthracnose resistance and high degree of perennation shown by some lines.

Breeding Ladino clover is receiving attention, the main defects at present being susceptibility to disease and drought and lack of competitive ability with tall-growing grasses.

Tobacco. One species resistant to anthracnose and another resistant to aphids were crossed with commercial tobacco. The name is not given for either species. The first cross yielded anthracnose-resistant male-sterile plants. In the cross for aphid resistance, a lethal factor usually caused death before flowering. One aphid-resistant plant was secured, producing many sterile flowers. Cuttings of the F_1 hybrids were tested with colchicine. Success has been gained in continuing this material by selfing and back crossing to commercial tobacco.

Further work was carried out on the development of tobacco resistant to black shank, mosaic, wild fire, black root rot and Granville wilt.

Sweet pepper. A line with a heritable propensity to produce a high frequency of haploid members in twin seedlings is being studied. The influence of the male parent upon the frequency of haploids derived from crosses of this line is being determined.

Forest trees. The possibility of developing pure-breeding lines from haploids among twin seedlings is being explored. Twins have so far been found in four soft-wood and one oak species. Chromosome counts are being made to see if haploids are present.

Sweet corn. According to F_3 data from a cross between a cytoplasmic ♂-sterile line and a ts_4-linkage tester, a pollen-restoring gene is situated on chromosome 3, about 1 unit from ts_4. Several chromosome-7 linkage testers restored pollen fertility completely in crosses with cytoplasmic sterile lines of C106^t and WF9^t origin.

199 **66th and 67th Annual Reports of the Agricultural Experiment Station of the Alabama Polytechnic Institute, Auburn, Alabama, January 1, 1955 to December 31, 1956.**
1958 : Pp. 77.

Maize. Sources of resistance to two *Meloidogyne* spp. have been found for breeding. The type of resistance consists of reduced root-gall formation.

White clover. A synthetic Ladino type has been developed from five clones selected for vigour, disease resistance and persistence. In preliminary tests, the synthetic has shown superiority over most other varieties in yield and persistence.

Lespedeza. Breeding of *L. cuneata* to improve palatability and nutritive value is receiving attention. Investigations have been carried out on (1) effects of stem type on feeding qualities, using rabbits, and (2) anatomy of fine, medium and coarse-stemmed types. The nutritive characteristics of the fine and coarse-stemmed types differed, both types having some desirable and undesirable properties. The rabbits consumed significantly more of the fine-stemmed type, which contained more total digestible nutrients. According to the results of (2), difference in lignification was mainly responsible for the lower degree of rigidity and toughness of the fine-stemmed type. Experimental varieties have been developed from fine-stemmed inbreds.

200 **71st Annual Report of the Mississippi Agricultural Experiment Station for the fiscal year ending June 30, 1958.**
Pp. 96.

Wheat. The varieties Chancellor, Taylor and Coastal are being improved for lodging and disease resistance by back crossing.

Oats. Progress is being made in producing lines resistant to the Victoria races of crown rust. Promising selections were made from crosses between two stiff-strawed, rust-resistant selections, CI6998 and CI7152, and high-yielding rust-susceptible commercial varieties. Irradiation has produced one plant which is both crown and stem-rust resistant.

Rye. New strains were found to have better grain and forage yields and more rust resistance than commercial varieties.

Maize. Experimental yellow double crosses surpassed commercial hybrids in yield and percentage of erect stalks at harvest. A large number of inbred lines have been tested for resistance to *Physoderma maydis*; resistant inbreds are being used to develop new material and to improve susceptible well-established lines.

Sorghum. Hybrids were found to outyield most varieties by 15–20%. A new variety, Wiley, proved superior in syrup yield and an experimental strain, Mer. 54–2, led in stalk yield. Advanced-generation selfed lines from Sudan grass x sorgo crosses appear to be resistant to leaf diseases; two selections are undergoing regional tests.

Grasses. Irradiation has improved seed setting by less than 1% and induced no resistance to *Claviceps paspali* in *Paspalum dilatatum.* In ryegrass, five cycles of selection by means of artificial inoculation have raised crown-rust resistance to an average of 96%. Selection for resistance to *Helminthosporium* is being continued. Only 6·03% of Johnson grass samples appeared to be self fertile. Hybrids between Johnson grass and sorghum are being selected for disease resistance and open panicles with large seed. Segregates from a cross between two lines of *Dactylis glomerata* have proved resistant to stem rust during the seedling stage.

Forage legumes. Some S_3 lines of crimson clover showed marked effects of inbreeding while others showed no deterioration in vigour. Irradiated crimson clover was found to vary in its reaction to sooty blotch. A new strain of red clover, resistant to powdery mildew, has yielded well and is soon to be released. Progeny of inbred and sibbed selections of white clover showed a high degree of resistance to two common nematode species. Selecting and inbreeding of Alsike clover for resistance to root-knot nematodes have continued; a few inbred lines appear to have considerable resistance. Variation in plant type and reaction to charcoal rot was found in the progeny of irradiated Alsike clover.

Sweet potato. An attempt is being made to combine quality with wilt resistance. One seedling is undergoing field trials on account of its excellent yield, good flesh colour and satisfactory baking and canning qualities.

Cotton. A chemical method of estimating the viability of seed has been perfected. At the Delta Branch Station, work has continued on the transfer of characters to doubled haploids. It has been determined that nectary absence, which is being transferred to the Upland strain M8948 from *Gossypium tomentosum,* is due to two recessive genes. A single, partially dominant gene from Hopi cotton has been found to produce glandless bolls and leaves when homozygous. The compound FW–450 was found to induce male sterility of varying degrees in Delta varieties. The development of smooth-leaved strains with a high yield and acceptable fibre properties for future release has continued.

Sweet pepper. Breeding for *Cercospora* and nematode (*Meloidogyne* spp.) resistance has continued by back crossing.

Sesame. Breeding for disease resistant and easily harvested varieties has been carried out at the Delta Branch Station. Numerous lines proved to be resistant to bacterial leaf spot but none to *Cercospora* stem spot.

Fruits. Breeding of tree and small fruits is in progress. Two new strawberry varieties, Pocahontas and Dixieland, have consistently outyielded Blakemore, the standard commercial variety.

Brassica. Desirable types of collard, resistant to bolting, have been selected from the variety Georgia.

Cucurbits. Crossings involving the cucumber varieties Magnolia and Model and downy-mildew resistant lines from Puerto Rico and USDA have been made. As no resistant lines were satisfactory for all the characteristics, high yields, dark green colour and good pickling, they will be back crossed. A cantaloupe variety suitable for transport, but with the same high eating and disease-resistant qualities as Homegarden, is being developed. New lines of water melon are being produced with combined resistance to *Fusarium* wilt, anthracnose and other diseases and good eating and transporting qualities. A Black Diamond type, Mississippi 1717, which is of high quality and resistant to wilt, has performed well in several trials.

Tomato. Breeding to incorporate resistance to *Fusarium* wilt and nematodes (*Meloidogyne* spp.) has continued; M–500, a Gulf States market type, is the most advanced line produced.

Cowpea. In an attempt to produce a *Fusarium*-resistant strain, crosses have been made between a commercial black-eye type and a brown-seeded resistant strain. Selection for the three recessive genes determining the eye and the several wilt resistant genes was carried out; several black-eye type plants were obtained with complete wilt resistance.

Soya bean. Progress has been made in developing lines of Dorman and Perry that are superior to Lee and Ogden in seed yield, disease resistance, seed quality and seed holding.

Pea. Efforts to obtain mutants resistant to *Ascochyta* leaf spot by X irradiation have been unsuccessful.

Sweet corn. Attempts are being made to produce high-quality hybrids with resistance to ear worm (*Heliothis armigera*) by top crossing selected breeding lines with Golden Security. The ability of certain inbreds to transmit ear-worm resistance is being studied.

201 **Results of research in 1957 by the Agricultural Experiment Station of the University of Kentucky. 70th Annual Report of the Director** : Pp. 90.

Wheat. The highest-yielding winter wheat varieties are Todd, Knox, Vermillion and Dual. Most emphasis in breeding is placed on improved quality, leaf rust and loose-smut resistance. Sources of leaf rust resistance from *Agropyron* and *Aegilops* species are being used.

Oats. Bronco is a higher yielding variety than Dubois, Atlantic or Forkedeer; it is also winter hardy. The outstanding experimental strain is Ky.53–368 (CI7132). In breeding work most emphasis is being placed on combining winter hardiness with straw strength.

Maize. Selection for specific attributes within élite segregating populations is being carried out.

Conversion of lines to cytoplasmic male sterility, using the Texas source of cytoplasm, and the removal or incorporation of restoration genes, in the latter case using the inbred line Ky21, is being effected.

The crossing of exotic material with locally adapted varieties gives a means of evaluating the genetic potential of the former which cannot itself be studied.

The systems of reciprocal recurrent selection, recurrent selection based on the phenotype and continuous selfing are being examined for relative efficiency.

Barley. Kenbar and Dayton are higher yielding than Ky1, and earlier planting increases the yield. Kenate is also a superior variety. The outstanding experimental variety is Ky51–5752 (CI10095) with good straw and smut resistance. Emphasis in breeding work is laid on straw strength, loose smut resistance, test weight and awnlessness. The best of the awnless selections have been poorer in yield and quality than bearded types. Some promising short-awned types have been back crossed to Kenbar with encouraging results.

Millet. Starr and Ga. hybrid 1 varieties are the most satisfactory under Kentucky conditions.

Sorghum. Mer53–15, Mer54–2, Mer54–14, Sart and Wiley are high in syrup yield but late maturing. Of the grain sorghums, Early Hegari was highest yielding and exceptionally tall.

Kentucky blue grass. Selections were evaluated for seed production, yield, disease resistance, heat tolerance, and crab-grass invasion. Several lines proved superior to commercial bluegrass.

Cocksfoot. The highest-yielding varieties are Potomac, Commercial and Ky Select; the last is recommended for use in Kentucky.

Timothy. Selection G3–80 has proved outstanding in its earlier spring growth, rapid recovery after clipping and forage production.

Brome. Varieties Southland and Achenbach are outstanding for persistence and yield.

Tall fescue. Synthetics and polycross progenies of inbred lines were significantly better grazed than naturalized and commercial varieties and compared favourably with Ky31. Line 45–50 was outstanding for palatability, drought and disease resistance, particularly to *Helminthosporium dictyoides*. Maternal-line polycross progenies were less palatable than inbred progenies.

Of ryegrass x tall fescue hybrids, a few lines were better grazed than Ky31. Some sterile F_1 hybrids treated with colchicine produced pollen, and one exceptionally leafy plant produced as a result gave large quantities of viable pollen.

Lucerne. The recommended varieties Ranger, Buffalo, Narragansett and Atlantic were among the highest yielding. Du Puits gave the highest yield at one location.

Red clover. Kenland continued to give the highest yield.

Tests were conducted on X_1 and X_2 plants grown from seed irradiated with γ rays and on X_1 plants from seeds irradiated with thermal neutrons. Germination of X_1 seed was unaffected but subsequent development was much distorted, and a considerable degree of sterility resulted.

Polycross progeny tests have been carried out with a view to producing superior synthetic varieties.

Clones of Kenland have been selected for resistance to yellow bean-mosaic virus.

White clover. The aim has been to produce a synthetic variety superior to those at present available in respect of vigour, flowering, leafhopper resistance and survival. It will be derived from polycross progenies from selected intermediate types.

Lespedeza. The Korean variety Rowan was recommended for use in Kentucky on account of its consistent high yield and resistance to powdery mildew and root-rot nematodes.

Sweet clover. Israel Annual is the highest yielding of the annual varieties tested and had finer stems and more foliage, remaining green until harvest. Of biennial varieties Evergreen is superior in quality and length of growing period.

Birdsfoot trefoil. Varieties Cascade and Mansfield gave highest yields.

Tobacco. Certain leaf abnormalities have been found to be controlled by recessive factors, probably in duplicate. These are: virescent, white seedlings later turning green; genetic vein-banding, a chlorotic condition of young leaves; and yellow Crittenden, causing Little Crittenden to appear yellow.

Immunity to *Thielaviopsis basicola* has been transferred from *N. debneyi* to *N. tabacum* and various crosses made to combine immunity in dark tobacco with resistance to wild fire, mosaic and *Fusarium* rot.

Genetic studies have been made of the factors controlling nicotine content and its variation with temperature. Late-season build-up of nicotine is controlled by either a nondominant or a dominant gene.

An unusual plant with about double the normal yield for Burley varieties was crossed with Ky41A; its unusual characters were largely retained in the F_1 and F_2. Cured tobacco from this line has been found satisfactory.

Species of *Nicotiana* immune to aphid attack have been used for crossing with Burley varieties. Introduced lines with some degree of resistance to hornworm attack have also been crossed with Burley varieties.

Strawberry. Selections of crosses effected in 1953 were made for further testing. Fairland and Albritton are being used as female parents, the former giving much better results. Where Midland was used as one parent the percentage of superior selections was greater.

The new variety Earlidawn is very early and high yielding, and shows particular promise in western Kentucky.

Tomato. The outstanding greenhouse variety is Michigan-Ohio Hybrid. Of field varieties Valiant and Morton Hybrid are best.

Snap bean. Variety B–2567–1 has performed well in all trials and is about to be released.

Soya bean. Clark, a fairly early variety, and Perry were the highest yielding named varieties.

Sweet corn. Studies on earworm control showed that Aristogold Bantam Evergreen had the highest degree of resistance.

Golden Hybrid 3494, Golden Yield and Victory Chief may be superior to Golden Security under Kentucky conditions.

Popcorn. Dwarf and normal US13 have been compared, showing the definite superiority of the latter.

202 **Agricultural research in South Dakota. Seventy-first Annual Station Report, July 1, 1957 to June 30, 1958** : Pp. 66.

Brief reports are given of breeding work carried out with cereals, forage grasses and legumes, flax, sunflower, castor oil plant, safflower, fruit trees, tomato and soya bean. In the reaction of lucerne to *Phoma herbarum*, there appears to be a diversity of genetic behaviour; in some cases reaction is additive; in others either resistance or susceptibility is dominant and also there are more complex interactions. A similar situation was found with regard to *Cercospora zebrina*.

203 **Research serves New Mexico agriculture. 69th Annual Report of the New Mexico Agricultural Experiment Station for the fiscal year ended June 30, 1958** : Pp. 83.

Wheat. A selection made in Nebraska in 1948 from Red Chief x Cheyenne has been released under the name of Aztec, its chief advantage being high bread-making quality.

Cotton. Acala 1028, a selection from Acala 1517C, was approved for commercial release. It has the advantage of greater tolerance of *Verticillium* wilt over the parent variety. Strains resistant to races 1 and 2 of bacterial blight reached an advanced stage of testing. With this material, an attempt is being made to combine resistance to the two races of blight with a degree of tolerance of *Verticillium* wilt equalling or exceeding that of Acala 1517C or 1517BR–1. Several of the blight-resistant strains have good fibre and spinning properties. Resistance to bacterial blight has been induced by X irradiation.

Lucerne. Breeding for resistance to diseases and spotted aphid (*Therioaphis maculata*) continued. New Mexico 16, released in 1956, has been named Zia. It is resistant to spotted aphid and prevalent crown and root diseases.

Chilli. Reselection of Rio Grande has resulted in an earlier-maturing strain (Rio Grande 21), superior to the original stock in plant type and fruiting habit. College 6 and Sandia have also been improved by reselection.

Pecan. Hybrid seedlings were selected for early maturity and nut characteristics. Varietal disparities were observed in tolerance of soil alkalinity.

Onion. Strain S–1A of White Grano has been developed by bulking 15 open-pollinated lines which had been rigorously selected for non-bolting. In a variety test it outyielded other short-day onions, except the F_1 hybrid Yellow Granex, and showed less bolting than any other White Grano strain.

Several inbreds of White Grano have been found to carry a recessive gene partly responsible for pollen sterility. It is suspected that several inbreds of this variety not yet tested may also carry the gene. Lines combining the cytoplasmic factor inhibiting pollen development and the gene will be pollen sterile. The production of F_1 hybrids will thus be considerably facilitated by the discovery of this gene.

Bean. Progress has been made in breeding pinto beans for resistance to common bacterial blight.

204 **Washington's research progress in agriculture and home economics.** Ext. Misc. Publ. Ext. Serv., Inst. agric. Sci., St. Coll. Wash. 1959 : No. 53 : unpaginated.

In addition to the work summarized below, brief mention is made of trials of oats, maize, forage grasses and legumes, flax, raspberry, blackberry, cranberry, grape, several different vegetables and tomato.

Wheat. Desirable agronomic characteristics, such as solid stems, and the resistance to leaf rust, stem rust, bunt and mildew of *Agropyron* species are being transferred to wheat varieties. Semi-dwarf selections, which continued to outyield commercial varieties, showed resistance to all known races of smut. Attempts are being made to develop a smut, leaf and stem rust, mildew and lodging resistant variety that can be either winter or spring sown. Selections from a cross using awned Onas, made in order to develop a superior spring variety, milled well, baked satisfactory bread at 12% protein and showed resistance to leaf and stem rust.

Barley. A short-strawed Hannchen-type variety has been produced by ionizing radiations; it is being crossed with high-yielding varieties in an attempt to develop a short-strawed high-yielding variety.

Potato. Attempts are being made to produce a new leaf-roll resistant variety, which has the shape, netted skin and quality of Netted Gem (Russet Burbank). So far no completely immune variety has been found, but a number of seedlings show high resistance to field infection.

Stone fruits. Apricot seedlings have been raised from Earliril crosses, and sweet cherry seedlings from crosses involving three hardy selections and eight varieties have also been made.

Blueberry. Cuttings from 265 F_2 seedlings of *Vaccinium uliginosum* x *V. corymbosum* and other named and unnamed selections have been planted for observation. Over 30 new hybrids have been made from *V. meridionale.*

Strawberry. Virus-free stock of Puget Beauty was released for breeding.

205 **Report of the Department of Agriculture, New Zealand, for the year ended 31 March, 1959** : Pp. 174.

In addition to the work reported below variety trials of raspberries, black currants, strawberries, root crops and other vegetables have been carried out.

Wheat. Selections from Arawa and Aotea are showing promise.

Barley. Variety trials have shown that the Danish variety Carlsberg was significantly higher yielding than Kenia and Research; more recently Carlsberg II has proved to be even higher yielding than Carlsberg.

Forage legumes and grasses. The Australian subterranean clover Bacchus Marsh has given better yields than the more commonly grown strains. Varietal trials of lucerne and some forage grasses are continuing.

Hops. New varieties, selected for root-rot resistance, high yielding capacity and good agronomic characteristics, will be released shortly.

206 **Report of the Department of Scientific and Industrial Research, New Zealand, for the year ended 31 March 1958** : Pp. 90.

Wheat. The breeding is aimed at producing: a general purpose variety similar to Aotea in yield but of better quality; a higher yielding and better quality variety to replace Arawa; an earlier nonlodging variety to replace Tainui and Goboi on North Island; a higher yielding form like Hilgendorf; and mildew, drought, and yellow-dwarf-virus resistant varieties. Genetical studies concern inheritance of kernel weight, grain shattering, protein, mildew resistance and grain colour.

Oats. Breeding for lodging resistance and resistance to crown rust is in progress. The genetics of hull type and seedling chlorosis is under study.

Forage crops. Improvement of the following is in progress: perennial ryegrass, Italian ryegrass, timothy, fescue, white clover, red clover, zigzag clover, *Lotus uliginosus* and *L. corniculatus.*

A new strain of cocksfoot has been released at Grasslands, which has higher production, particularly in winter and spring, than other strains in New Zealand, without loss of palatability, summer persistence or seed production. Selection has been carried out to obtain a good early strain of lucerne and one with good drought resistance. Breeding work has been directed at obtaining strains combining earliness with high production, and creeping varieties with high productivity and extended growing season. White clover is being bred for an easily identifiable leaf marking. The genetics of production of ryegrass is being investigated. A study of polyploids in red clover and *Lotus* is being made. A new strain of *L. uliginosus* is under trial which is more vigorous than others and should prove valuable on difficult terrain. It is hoped that winter productivity may be improved by hybridizing with Portuguese strains, and an artificially induced tetraploid with seeds of double the normal size is being used to improve establishment.

Yellow and blue lupins have been bred for rapid early growth, low alkaloid content, high seed production and nonshattering pods.

Turnip. Investigations have been made into sources of resistance to cauliflower mosaic, and breeding work has been directed at the production of a club-root resistant green globe type.

Swede. Sensation is resistant to virus infection and Calder, derived from it, is resistant to both virus and cabbage aphid. Doon Spartan, a recently introduced variety, has similar resistance to Calder. Breeding work on resistance to dry rot has been carried out and studies made on inheritance of split cotyledons and split petals.

Potato. The breeding programme includes resistance to *Phytophthora infestans, Ph. erythroseptica,* X and Y viruses and leaf roll. The genetic nature of virus and blight resistance has also been investigated, and studies of the different strains of X and Y viruses and of potato blight made.

Flax. A rust-resistant variety has been produced.

Tobacco. Variety trials of local and overseas lines have been carried out, and breeding for resistance to black root rot, mosaic, *Verticillium* wilt and *Phytophthora* canker is in progress.

Hops. Two seedlings have been selected for resistance to *Phytophthora* and propagation of these and the English variety Bullion has commenced. Botanical characters as an aid to varietal differentiation have been studied and foreign varieties evaluated.

Rape. Breeding work has resulted in the production of a rape which resists attack by *Brevicoryne brassicae* from a cross between a club-root resistant rape and the aphid-resistant Calder swede. The best selections have been found to be at least as productive as Broad Leaf Essex, and as readily eaten by lambs.

Citrus fruits. These are being bred for the production of hybrids suitable for local conditions.

Strawberry. Breeding of a variety resistant to virus and root rot and with the desirable characteristics of Captain Cook is being attempted.

Onion. White-rot resistance has been the aim of the breeding programme.

Cabbage. Population studies of cabbage aphids on resistant and susceptible hosts have been made. Breeding work has been directed towards club-root resistance and uniformity.

Cauliflower. The breeding programme has included work on club-root resistance and uniformity.

Tomato. This crop has been bred for spotted-wilt and leaf-mould resistance.

Pole bean. Breeding for rust resistance is in progress. An investigation has been made of sterility factors in Pukekohe Long Keeper, and their possible utilization in a hybrid programme.

Pea. Mosaic immunity has been investigated in wilt-resistant varieties. Selections for wilt resistance have been made in Onward, William Massey, Blue Prussian and Partridge.

207 **Report of the Department of Scientific and Industrial Research, New Zealand for the year ended 31 March 1959** : Pp. 112.

In addition to the information summarized below, breeding of cereals, forage grasses and legumes, tobacco, hops, various root crops, vegetables and fruits is in progress.

Linseed. A rust-resistant variety has been produced.

Pea. Two recently released varieties, Greenfeast WR and Onward WR, are wilt resistant with yields equal to those of the varieties from which they have been derived.

208 **Report of the Waite Agricultural Research Institute, South Australia 1956-1957** : Pp. 60.

Virus genetics. Work was carried out on recombination between strains of tomato spotted wilt virus [cf. XXVIII, 1028].

Wheat. A large new collection of varieties from a wide range of foreign countries is being studied with a view to choosing material suitable for two subjects of research: genetical and environmental factors affecting quality characteristics, particularly with respect to protein, and (2) the effect on yield caused by introducing new genes into Australian wheats from foreign varieties.

Barley. The mode of inheritance of quality characteristics is receiving intensive study. Varietal disparities in nitrogen percentage of the grain were found to be greater than had previously been reported.

Dactylis. Breeding to develop strains of *D. glomerata* for cultivation as a perennial pasture grass in different areas in South Australia continued. The material under investigation includes hybrid progenies derived from crosses between nine contrasting plants from the Mediterranean region and northern Europe. These progenies and their parents are also undergoing cytological study. Incompatibility in *Dactylis* is receiving attention, using "three diploid plants from Israel and three plants of *Dactylis aschersoniana*" as parents.

Phalaris. Inbreeding of *Ph. tuberosa* is in progress.

209 **Tenth Annual Report of the Commonwealth Scientific and Industrial Research Organization, Australia for year 1957-58** : Pp. 174.

General genetics. It was found that in a thiamin-requiring mutant of *Arabidopsis thaliana*, a genetic block operates in the pathway leading to the formation of 4-methyl-5β-(hydroxyethy 1)-thiazole.

Maize. A comparison of recombination fractions in autotetraploids and diploids and the frequency of double reduction in tetraploids indicated that recombination is more frequent in the centric regions of chromosomes in autotetraploids than in diploids.

Grasses. In order to obtain data on the use of synthetic alloploids in breeding, a series of hybrid combinations between different strains of *Phalaris tuberosa* and *Ph. arundinacea* and of *Ph. tuberosa* and *Ph. minor* have been made. These hybrids are uniformly sterile and exhibit a range of flowering times. Large genetic differences have been shown to occur between strains of the Australian commercial *Phalaris*. The new hybrid, *Ph. brachystachys* $(2n = 12)$ x *Ph. minor* $(2n = 28)$, forms rare bivalents at first metaphase due to autosyndesis or to allosyndesis involving either of the two genomes known to be present in the latter species. The univalents display neocentric activity and these may be the same chromosomes as show this activity in other *Ph. minor* hybrids. Cytotaxonomic studies on Australian *Danthonia* species and a series of F_1 hybrids indicate that the species are widely divergent. Speciation appears to have occurred by genic changes at the diploid level and by allopolyploidy following interspecific hybridization. Means are being sought for inducing variation in apomictic species such as *Paspalum dilatatum* and *P. scrobiculatum.* Chromosome numbers of *Themeda australis* have been confirmed as $2n =$ 20, 30, 40, 50 and 60, with geographical differentiation of the various races. The requirements of two strains for flower initiation have been found; both strains proved to be long-day plants with a response to cold treatment. Attempts have been made to produce awnless hybrids of *Hordeum bulbosum* with diploid and tetraploid awnless *H. vulgare* and to induce awnless mutants. Hybridization, followed by embryo culture, produced embryos which all died shortly after germination. A study is being made of intrastrain and interstrain variation for such characteristics as time of flowering, stolon development, frost tolerance and persistence under grazing in *Chloris gayana.*

Medicago. Further selections are being made following back and top crossing in *M. sativa.* The inheritance and general and specific combining ability of cold hardiness have been determined by using an electrical conductivity method. During strain trials at Deniliquin, Hairy Peruvian, Indian and African had a winter growth rate which was 60% of the summer growth rate, compared with 44% for Hunter River. Attempts are being made to transfer high winter yield to Australian, South American and Indian creeping-rooted lines. Significant specific combining effects for forage yield were found in the F_1 generations of *M. sativa* and *M. falcata.* High correlation coefficients between forage and seed yields and genotypic correlations indicate the possibility of improving both these yields simultaneously and of utilizing heterosis for breeding.

Other forage legumes. Further crosses have been made between strains of subterranean clover incompatible with Tallarook types; several of the F_1 generations proved inviable. Five strains have been selected for possible resistance to stunt virus. Of these, Tallarook showed high resistance, and inheritance studies are in progress. Studies of five strains at various temperatures showed that temperature, strain and temperature x strain interactions were significant for growth indices. Selection is being carried out among second generation plants of Tallarook for early-flowering and other potentially desirable mutations.

A genetic analysis of symbiotic variation in *Trifolium ambiguum* is being made. Crosses between a nonstoloniferious, short-lived perennial upland strain of *Indigofera endecaphylla* and a perennial, stoloniferous lowland strain have been obtained. Progeny from *Phaseolus lathyroides* x *Ph. semierectus* did not show resistance to root-knot nematode and *Phaseolus* virus 2. Strains of *Ph. atropurpureus* were found to show persistence, ability to recover from grazing and nematode resistance. In *Leucaena glauca,* significant interstrain variation occurs in growth habit and production; strains from Peru and El Salvador are most vigorous and are being used as parental varieties in a crossing programme. Selection and development of strains with a low mimosine content are in progress.

Tobacco. Experiments to transfer resistance to blue mould (*Peronospora tabacina*) from Australian species of *Nicotiana* to commercial varieties of *N. tabacum* were continued. A few of the back-cross progeny are resistant and resemble flue-cured tobacco in superficial characters. Some resistant plants have been produced from seeds of pollen treated with ultraviolet rays. One spontaneous mutation from an untreated seed of Virginia Gold also took place. Of a wide range of varieties tested for susceptibility to blue mould, growth, morphology and curing behaviour, two Clayton hybrids and a *N. tabacum* x *N. debneyi* amphidiploid from Canada remained free of blue mould.

Tomato. F_1 plants were selected for resistance to root-knot nematode (*Meloidogyne* spp.). Resistant mutants were selected from plants following ultraviolet and X irradiation of pollen. Induced resistance appears to be due to a single dominant gene, with a resistance pattern similar to the *Mi* gene from *Lycopersicon peruvianum.* Genotype-environment interactions in diallel crosses grown at different levels of nutrition are being studied and a comparison is being made of recombination values obtained from trisomic and disomic individuals.

210 **Annual Report of the Department of Agriculture and Stock, Queensland for the year 1957-58** (1958) : Pp. 122.

Wheat. In trials carried out in conjunction with breeding at the Hermitage Regional Experiment Station, selections from Lawrence x Gabo were outstandingly good. One of these (LG5391) again proved to be the entry giving the highest yield in the open plains of the Darling Downs and is now undergoing increase for naming and release. Other wheats being multiplied prior to release include (1) a stem-rust resistant form of Puora developed by back crossing and (2) a white-grained dual-purpose type intended to replace red-grained K41 PF–4473.

Maize. Trials were made to compare Q23 hybrids respectively produced with the aid of a male-sterile parent and by detasselling. The hybrid produced by the former method was slightly higher in yield in all tests.

Sorghum. Introduction of male-sterile lines from the USA has made it possible to initiate hybrid breeding.

Dichanthium. Preliminary genetical studies on strains of *D. sericeum* have provided evidence of wide variation.

Citrus. New mandarin hybrids are under observation at the Gatton Regional Experiment Station, the chief aim being extension of the cropping season.

Passiflora. Lines with *Fusarium*-wilt resistance and acceptable horticultural characteristics have been secured from crosses between *P. edulis* and *P. flavicarpa.*

Papaya. Hybrid 5, produced by crossing pure lines of Bettina 100A and Petersen 170, is to be released.

Bean. The rust-resistant varieties Redlands Belle and Redlands Beauty are to be released. In breeding to develop a stringless variety comparable in quality to commercial string beans, some lines from crosses between stringed and stringless parents show promise.

211 Annual Reports of the Department of Agriculture, Tasmania for 1956-57 : Pp. 75; and 1957-58 : Pp. 84.

Wheat. Progress has been made in breeding for rust resistance, using crosses between Tasmanian wheats and resistant introductions.

Oats. A selection from a cross made by the New South Wales Department of Agriculture has been named Blythe and introduced. It has shown superiority over the certified strain A236 of Algerian in grain quality and straw strength, while being at least equal to A236 in grain yield and usually more productive of green fodder.

Potato. Breeding for resistance to late blight and viruses continued. A race isolated from seedlings previously found resistant to the common race of late blight was identified as race 1. As in other countries, it had apparently arisen by mutation of the common race.

Hops. Collection of material for crossing was initiated. Tasmanian commercial varieties were treated with colchicine to induce polyploidy.

Tomato. The possibility of exploiting hybrid vigour is under investigation.

212 Biennial Report of the Hawaii Agricultural Experiment Station 1956-1958 (1958) : Pp. 74.

Forage legumes. Irradiation of *Indigofera endecaphylla* with γ rays resulted in chimeral mutation. Flowering could be induced by treatment with short days. Flowering in *Trifolium repens* was found to be under differential genetic and environmental control. By changing environmental factors, plants which do not normally flower in Honolulu could be made to flower.

Sweet potato. The two best clones, Onolena, noted for good root appearance, keeping and table quality, and HES 8, characterized by high root yields, have been successfully hybridized. Improved yields have been obtained from roots of Onolena that have been subjected to natural ionization and irradiation with Co^{60}.

Macadamia. Three varieties, Kakea, Ikaika and Keauhou, have proved to be the most suitable for commercial planting. Four new selections, 294, 344, 650 and 670, undergoing advanced tests, show promise for commercial growing.

Passion fruit. Fruit set, size of fruit and juice yield are related to the amount of pollen applied to the stigma.

Papaya. Two promising selections, H27–9 and E131–23, are being tested against Solo for yielding ability. Progress has been made in the breeding of strains that are comparatively free from carpellody of the stamens and summer sterility.

Onion. Selection for low splitting in Red Creole has reduced the percentage of splitting from 97·7 in the original accession to 20·0.

Lettuce. In an attempt to increase head size, Anuenue and Kaala are being crossed with Great Lakes.

Cucurbits. Efforts continue to produce musk melons which combine the disase resistance of Georgia 47 with the flavour and size of some Mediterranean types. A new hybrid cucumber, Ilima, has a high degree of mosaic resistance and improved fruit colour and quality.

Tomato. A new variety, Anahu, has been released; it is resistant to root-knot nematodes and to three other diseases. It has proved to be useful in breeding multiple disease-resistant F_1 hybrids.

Pea. Improved strains of the powdery-mildew resistant edible podded pea, Manoa Sugar, have been released.

213 NICHIPOROVICH, A.
Phytosynthesis and problems of plant breeding.
Pakist. J. Sci. 1958 : **10** : 261–63.

Ways in which the breeder should consider photosynthetic activity and efficiency are suggested.

214 OZOL [OZOLS], A.
(Experimenting on plants with the aid of a radiation field of γ rays).
Latv. PSR Zināt. Akad. Vēstis 1958 : No. 12 : 75–78. [Russian].

A radiation field with Co^{60} has recently been established in the grounds of the Botanic Garden of the Latvian Academy of Sciences for the purpose of studying the effect of radiation upon growth, development and induction of mutations in many agricultural and horticultural plants.

Vorträge der 12. Hochschultagung der Landwirtschaftlichen Fakultät der Universität Bonn am 7. und 8. Oktober 1958 in Bonn. (**Papers of the Twelfth High School Session of the Agricultural Faculty of Bonn University on 7 and 8 October 1958 in Bonn**). Pp. 195.

215 *Stubbe, H. Einige Ergebnisse der Mutationsforschung an Kulturpflanzen. (Some results of mutation research on cultivated plants). (pp. 105–26).*

In this survey special mention is made of work carried out at Gatersleben, where artificial mutants of barley, soya bean, tomato and apple are being studied. Data are provided on the alkaloid contents of some tomato mutants; three mutants of *Lycopersicon pimpinellifolium* have particularly high tomatin contents.

216 ADAMEC, J. & OPAVA, J.
Übersicht einiger gelöster Forschungsaufgaben der Tschechoslowakischen Akademie der Landwirtschaftswissenschaften auf dem Sektor der pflanzlichen Produktion. (**A survey of some solved research problems of the Czechoslovakian Academy of Agricultural Sciences in the Plant Production Department**).
Za socialist. sel'skohozjajstv. Nauk. (For socialist agric. Sci.), Praha 1959 : **8** : 7–50.

This account includes descriptions of some varieties recently bred in Czechoslovakia.

Wheat. The spring variety Dobrovice 3 is resistant to lodging, mildew, rust and loose smut. It is medium late, high yielding and of good baking quality; also it withstands dry conditions well and can be sown early.

Maize. At Lednice a new medium-late variety has been developed from a cross of Böhmischer Pferdezahn [Bohemian Dent] with Slowakischer Gelber Mais [Slovak Yellow maize]. The new variety has a vegetative period of 112–153 days and the yield is high. It shows average resistance to smut. Grain from the first generation of the cross is intermediate in form between that of flint and dent maize. Also an early variety has been developed at the Lednice Station; this hybrid gives a high yield of good quality grain and is suitable for mechanical harvesting. The medium-early hybrid K,Z arose from a cross of Kočovská raná [Kočovce Early] x Böhmischer weisser Pferdezahn [Bohemian White Dent]; it is high yielding and has a growing period of 112–143 days. This variety is suitable for grain production in favourable situations and is also suitable for green fodder and ensilage.

Barley. Semčický hospodářský [Semčice Agricultural], a medium-early variety, was selected from a cross between Dobrowitzer Altböhmische [Dobrovice Old Bohemian] and Dänische Maya [Danish Maja]. It is short-stalked, very resistant to lodging, suitable for combine harvesting and outyields other common varieties. This variety is of low malting quality but will probably be widely used for fodder.

Potato. Jara [Spring] is a very early variety which pregerminates well and the yellowish tubers have a good flavour and shallow eyes. The yield from Jara is lower than that of other varieties and the starch content is about 15%. It is resistant to wart and fairly resistant to viruses but susceptible to *Phytophthora* and *Spondylocladium*. Also Jara frequently suffers from a physiological disorder in which the leaves roll up. Ambra is also described [cf. XXV, 2183].

Mangel. A red semisugar beet was obtained at Semčice by crossing sugar beet with the mangels Rote Eckendorfer [Red Eckendorf], Rote Mammut [Red Mammoth] and Mettes Rote Leisen [Mette Red Leisen]. The root yield from this variety is 400–600 dz. per ha. in good soils and the dry matter content and yield of leaf is also high. Unfortunately the roots are more difficult to dig up than those of other high-yielding mangels. A high-yielding semisugar beet of yellow colour has also been bred at Semčice; this variety originated from a cross of sugar beet with the mangels Dänischer Barre

[Danish Barres], Gelbe Griewener* and Gelbe Eckendorfer [Yellow Eckendorf]. The yield of roots from this hybrid is 400–500 dz. per ha. in good soils; the dry-matter content is higher than that of the red semisugar beet and uprooting the crop is easier.

Hops. Oswald clone 31, bred in Žatec, is an early or medium-early red variety with a vegetative period of 120–130 days. It is suitable for heavy soils and damp situations; the yield of dry hops is 10–12 dz. per ha. The content of soft resin is 11·38%, of humulone 4·66%, and of lupulin 6·62%. Another new variety from the same breeding station is Oswald clone 72, a medium-early red hop which is very vigorous. The growing period is 120 to 130 days and is very variable. This is not a demanding variety but in very damp years and in closed situations it is susceptible to *Peronospora.* The average yield of dry hops from this clone is 11–13 dz. per ha. The content of soft resin is 11·87%, of humulone 5·01%, and of lupulin 6·8%. Oswald clone 114, with an average yield of 10–12 dz. per ha., is an early red variety with a maturity period of 110–125 days. It is suitable for dry soils and open situations and is of average vigour. The soft-resin content is 11·97%, the humulone 5·12%, and the lupulin 6·87%.

Sweet pepper. Mährische Obst [Moravian Fruit] is a semiearly variety selected from material descended from Rotund Grüne[Rotund Green], Rotund Milchigglänzende [Rotund Milky Shining] and Kalvill Gelbe [Kalvill Yellow]. This plant is low growing and the fruits are ovoid, being greenish yellow when the flesh is ripe and red when the seed is ripe. The taste is sweet and slightly spicy.

Medicinal plants. Improved varieties of *Anthemis*, *Angelica*, *Chenopodium*, *Althaea*, *Plantago*, *Verbascum*, *Galega* and *Glycyrrhiza* are described.

Celeriac. The new variety Olomouc is particularly suitable for cultivation in dry regions and the maturity period is 200–230 days. With suitable manuring, root tubers weighing 500–1000 g. have been obtained. This variety is resistant to leaf and tuber rusts.

Cabbage. The early variety of white cabbage, DO, was developed from Früher Junirot [Early June Red], Kopenhagener Marktkohl [Copenhagen Market cabbage] and Dithmarscher Früher [Dithmarsch Early]. It has a growing period of 100 days, is very resistant to cold, and, when planted in the early spring, is not susceptible to mildew. The round head weighs between 2 and 2·5 kg. The stalk is 3-4 cm. wide at the base of the head and the height of the stalk within the head is between ⅓ and ½ the height of the head. The cabbages may be left in the field for some days after they are ready for eating and there is very little loss through bursting of the heads. The cooking quality and vitamin C content of DO is good.

Melon. The sugar melon Lednice was selected from a natural cross of Konsul Schiller x Vatersorte [Father variety]. It is vigorous and has a prostrate stem; the fruit is of medium size and the orange-yellow flesh is juicy and has a sweet refreshing taste. This variety is popular and withstands dry conditions well.

Cucumber. Mladoboleslavská salátnice [Mladoboleslav Salad] was selected from Černavská. It yields cylindrical fruit of average length; the fruit does not develop a neck. The white flesh is sweetish and the core small. The period of development up to the first harvest is 70 days and the fruiting period 62 days. This new variety yields well even on heavy soil and is also relatively drought resistant.

Tomato. The new variety R14, derived from Rhineland, Mikado and *Solanum racemigerum*, is between 7 and 14 days earlier than other forcing varieties grown in Czechoslavakia. The foliage is less well developed and the fruit is therefore less shaded by neighbouring bushes. Also the fruit is less susceptible to cracking. Olomoucké nizké [Olomouc Low] is a new early variety selected from a cross of Self Pruning x Niedriger Busch [Low Bush]. It grows into a short, much-branched bush with medium-sized leaves. The brick-red fruits of average size weigh about 70 g.; the vegetative period is about 128 days. This variety is suitable for culinary and industrial purposes.

Bean. Kvalita [Quality], a green dwarf bean, is stringless and the pods are also free from internal membrane; it is particularly suitable for canning. The development period is about 60 days. This variety originated from a cross of Schreibers Granda with Comodore. An early dwarf bean with flat pods was bred from the same parents; it is suitable for use as a fresh vegetable but not for canning. Mährische Perle [Moravian Pearl], an early yellow variety of dwarf bean, was selected from a cross between Comodore and Schreibers Frühe [Schreiber's Early]. This variety is also free of fibre and membrane. It is suitable for fresh use and preserving, including deep freezing.

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* Presumably Gelbe Criewener [Criewen Yellow].

Pea. Klatovská ozimá [Klatovy Winter] is a new variety of field pea which has been developed from a land variety cultivated in Klatovy and Sušice for many years and originating from Russia. This is a much branched variety and the pods contain 8–10 seeds, the thousand seed weight being 108–150 g. It is medium early and the vegetative period is 278 days. Klatovská ozimá is suitable for all soils where rye is grown. An early spring variety has also been selected from another land variety of Russian origin. This new variety has a vegetative period of 107 days and the thousand seed weight is 144–213 g. The plants are tall with weak and much branched stems.

The vegetable pea Olmützer Früheste W [Olomouc Earliest W], is a very early type, the period from sowing to the first harvest being 68–72 days. This variety grows well even under cool conditions. It is resistant to anthracnose and only slightly susceptible to other diseases. Shelling the seeds is easy and the fresh peas have a pleasant sweet taste. This variety is particularly suitable for use as a fresh vegetable.

Rankenlose Markerbse [Runnerless Marrowfat pea] produces no runners until a late stage of development, thus making it possible to use machine cultivators between the rows. This medium-early variety has a vegetative period of 80–84 days and grows to a height of 40–60 cm. It is resistant to anthracnose and the yield of pods is above average, the yield of fresh seed being also relatively high. The very sweet seed is of good flavour and suitable for processing.

Parsley. The parsley Olomoucká dlouhá [Olomouc Tall], selected from a land variety originating from southern Moravia, is a high-yielding variety whose root is resistant to rust. This variety is not very demanding and is suitable for heavy and fairly heavy soils; it also withstands drought fairly well.

217 **Crop varieties.**
Report, Lafayette, Ind. 1958 : **1** : No. 4 : 5–7.

Developed at Purdue University Agricultural Experiment Station, the new tomato varieties Stair and Caro-Red [cf. XXIX, 833 and 4589] and an improved soya bean, Lindarin [XXIX, 3260], are described. Shelby, another new soya bean variety [cf. XXIX, 2060], matures six days earlier than Clark and about the same time as Lincoln. It was developed by selection from the back cross Lincoln x (Lincoln x Richland). Mention is made of two new maize hybrids, resistant to *Helminthosporium turcicum* (*Trichometasphaeria turcica*) and adapted to the conditions of southern Indiana; they will be released in 1960. Both hybrids outyield the standard Indiana hybrids, even under normal conditions. By back crossing Clintland to stem-rust resistant oat varieties, Clintland 60 has been produced, primarily for resistance to stem rust (*Puccinia graminis* var. *avenae*).

218 POOLE, C. F.
New sweet potato and lettuce varieties developed by H.A.E.S.
Hawaii Fm. Sci. 1959 : **8** : No. 1 : 1–2.

A new sweet potato variety, Iliula, has been produced from Nancy Hall and an unknown pollen parent. It has red-skinned uniformly sized roots, a fairly good flavour and higher yields and a higher percentage of grade A roots than the present standard variety, Onolena. However it does not bake quite as well as Onolena.

By crossing Anuenue and Kaala and also back crossing these lettuces to Great Lakes, a considerable number of breeding lines have been produced from which three promising varieties have been selected. Laupili has proved outstanding at high elevations, Kauwela does best on lower ground, while Kulanui does well at both elevations, but especially on high ground. The last variety produces the heaviest heads and matures earlier than the other large-headed types.

219 HELBAEK, H.
Domestication of food plants in the Old World.
Science 1959 : **130** : 365–71.

With reference chiefly to the literature on archeological findings, the author discusses the domestication of the wheats and barley from the comprehensive "paleoethnobotanical" view. More briefly, he also considers the domestication of a number of other food plants, such as rye, oats, pea, broad bean and fruits.

220 BOCANEGRA, S., MÉNDEZ, D. & HUANQUI, R.
Ensayos en frijol y algodón con gameticidas. (**Gametocide experiments with French bean and cotton**).
Bol. trimestr. Exp. agropec., Progr. Coop. Exp. Agropec., Lima 1958 : **7** : No. 4 : 12–17.

Treatment of the French bean Canario during flowering with (*a*) 0·5%, (*b*) 1·0% and (*c*) 1·5% solutions of a previously described gametocide [cf. XXVIII, 1856], here designated FW–450, resulted in 80% sterility of the pollen grains in (*c*) plants a fortnight after treatment; the other experimental plants had normal or nearly normal pollen. Vigour was reduced in all three groups, the respective pod sets for (*a*), (*b*) and (*c*) being 14, 8·3 and 1·8% of the control.

After treating the cotton variety Tangüis with a 1% solution, a reduction in size of flowers and capsules and in number of viable seeds was observed, and four to six weeks after treatment, 90–100% of the flowers contained anthers which failed to open and contained a high proportion of sterile pollen. During the third and fourth weeks some degree of female sterility was also observed. The possibility of using FW–450 in the production of F_1 hybrids is briefly discussed.

221 DUVICK, D. N.
The use of cytoplasmic male-sterility in hybrid seed production.
Econ. Bot. 1959 : **13** : 167–95.

In this review, mention is made of the use of cytoplasmic male sterility in breeding commercial hybrids of onion, sugar beet, maize and grain sorghum. Cytoplasmic male sterility has also been found in many other crops, including sweet corn, popcorn, mangel, beetroot, fodder sorghum, pearl millet, carrot and sweet pepper and experiments on the exploitation of this sterility are under way in various countries.

222 GRIDGEMAN, N. T.
Group size in taste sorting trials.
Food Res. 1956 : **21** : 534–39.

Two sets of experimental trials with substances differing slightly in flavour showed that such small differences are more easily detected when the samples are presented as 4*N* pair comparisons than as *N* octads to be sorted by taste. The statistical theory of such trials is discussed and the tentative generalization is made that the larger the group presented to the subject in a tasting trial, the less efficiently can he exercise his ability to discriminate.

223 ŽUKOVSKIJ, P. M.
(At the centres of origin of the cultivated plants of Latin America).
Bot. Ž. (Bot. J.), Moskva 1959 : **44** : 722–37. [Russian].

A further account [cf. XXIX, 3582] is given of the expedition to South America in 1958. Reference is made to reports of the existence of wild forms of *Solanum tuberosum*, and of diploid forms, on islands of the Chiloé archipelago, but the author did not succeed in finding them. He found *S. maglia*. He considers *S. tuberosum* to be distinct from *S. andigenum* in ecological type and in origin. He points out that the yellow-fleshed forms are all superior in flavour to the white-fleshed. *S. curtilobum*, though pentaploid, forms seeds and gives fertile hybrids when crossed with *S. andigenum*. Mention is made of blight-resistant varieties such as Cunca and Fino recently produced in Chile from crosses of *S. demissum* with *S. tuberosum*. All varieties of potato introduced from the USA, Europe and elsewhere as blight resistant have, it is stated, succumbed in Mexico to the local races of *Phytophthora infestans*, to which the wild forms of *S. demissum* are not fully resistant.

Some data are given concerning the races of various other plants in the different countries of Latin America, of which collections were made. These include maize, *Phaseolus vulgaris*, *Ph. lunatus*, *Lupinus mutabilis*, *Arachis monticola*, *Gossypium hirsutum*, *G. barbadense*, *Capsicum annuum*, *C. pubescens*, *C. pendulum*, *Lycopersicon peruvianum*, *L. hirsutum*, *Cucurbita moschata*, *C. ficifolia*, *C. andreana* and *Fragaria chiloensis*.

224 RUDORF, W.
Problems of collection, maintenance and evaluation of wild species of cultivated plants.
Pl. Introduct. Newslett. FAO 1959 : No. 5 : 1–4. (Mimeographed).

The writer recommends that the collection, maintenance and evaluation of wild species as sources of resistance to pests and diseases should be made the object of international cooperation. Collection should be regarded as a permanent task and be carried out by scientists living permanently in the countries being explored or who are well acquainted with these countries. Adequate investigation of plant associations, climatic and edaphic conditions and the phytopathological situation is necessary in conjunction with collection within a given region. Collections should be maintained and initially evaluated within the regions of origin of members of the genus in question.

I Kongres Stručnjaka za Zaštitu Bilja 29.X - 1.XI.1957. **(First Congress of Experts on Plant Protection, 29 October - 1 November 1957).**
Zaštita Bilja 1958 : No. 47–48 : 1–246.

225 *Lušin, V. & Panjan, M. Rezultati dvogodišnjeg ispitivanja otpornosti krumpira na rak. (The results of two years of testing the resistance of potatoes to wart). (pp. 65–66).*

Twenty-seven varieties found to be resistant to wart under conditions of artificial infection at Zagreb are listed.

226 *Janežić, F. Rad sa krompirovim rakom u Planini pod Golicom. (Research on potato wart in Planina pod Golicom). (pp. 67–71).*

Many varieties were tested for resistance to *Synchytrium* at Ljubljana and 18 which have proved immune are listed.

227 *Špehar, V. & Prpić, Z. Ispitivanje rasa crne žitne rđe. (Studying the races of black rust of wheat). (pp. 79–84).*

The physiological races of *Puccinia graminis* occurring in Croatia have been studied. Only the soft wheat Kota was found to be immune from all races, including two unidentified ones.

228 *Pobegajlo, I. Mozaik smokve* (Ficus *virus* 1) *u Hercegovini. [Fig mosaic* (Ficus *virus* 1) *in Hercegovina]. (pp. 147–54).*

The varieties Jarakovka and Bjeluša [White] are referred to as highly resistant to the above virus.

229 *Mirić, M. Ispitivanje otpornosti važnijih domaćih i uveženih sorata i linija kukuruza prema* Helminthosporium turcicum *Pass. (Testing the resistance of the main domestic and introduced maize varieties and lines to* H. turcicum *Pass.). (pp. 163–68).*

The cultivar Vukovarski zuban [Vukovar Dent] and the hybrids Novi Sad x Vukovarski zuban and Hy x L–317 were the most resistant among material tested in Belgrade.

230 ÅKERBERG, E.
Resistensförädlingen gör framsteg. **(Resistance breeding makes progress).**
Lantmannen, Stockholm 1959 : **70** : 587–89.

A popular account of Swedish work on breeding for resistance to black rust in cereals, to late blight in potato and to eelworm in red clover is presented.

231 1949–1959. 10 jaar I.P.O.-onderzoek. **(1949-1959. Ten years' research at the Institute for Plant Pathology Research).**
Meded. Inst. PlZiektKund. Onderz., Wageningen 1959 : No. 193 : Pp. 123.

Wheat. The varieties Webster, Heines Kolben [Heine's Club], Rouge prolifique barbue [Bearded Red Prolific] and Spalding's Prolific vary in reaction to infection with pure races of yellow rust even under constant temperature and humidity. In 1956, race 53 was found on Chinese 166; the varieties Capelle Desprez, Riebesel 47/51, Reigersberg 42 and Funo are all highly resistant in the seedling stage. A further race found on Leda and Alba elicits the same response from standard varieties as 7x but gives rise to different reactions in the field and differs in overwintering ability.
A new race of loose smut attacking Leda has been found.
Rye. From a population of which about 5% was resistant to stem eelworm, progeny consisting entirely of plants showing only a weak or no reaction to inoculation were obtained in the course of three generations.
Turnip. The occurrence of at least six races of club root in the Netherlands and Belgium has been established.
Tobacco. In breeding for mosaic resistance, American varieties with tolerance derived from Ambalema or resistance from *Nicotiana glutinosa* are being used.
Cucumber. The mosaic-tolerant variety Guntruud has been developed from a cross between the highly tolerant Japanese cucumber Tokyo Long Green and the Netherlands variety Baarlose Nietplekker [Spineless Nonspotted]; Guntruud is also resistant to *Cladosporium cucumerinum.*
Tomato. Differences in resistance to corky root have been detected among wild *Lycopersicon* species.
Phaseolus. The races α, β, γ and δ of *Colletotrichum lindemuthianum* have been identified in the Netherlands. Resistance genes to one or more races are known in several common varieties. A few lines with combined resistance to all four races of *C. lindemuthianum, Pseudomonas phaseolicola* and three viruses have been developed.
Pea. Several varieties in the official list are completely resistant to top yellows. Material resistant to *Fusarium oxysporum* f. *pisi* has also been obtained.

232 MATSUURA, Y. & TAKAHASHI, K.
(Studies on diseases of crop plants caused by *Rhizoctonia solani* Kühn. I. The characteristics in culture of a number of fungal isolates from diverse hosts).
Ibaraki Daigaku Nogakubu Gakujutsu Hokoku/Sci. Rep. Fac. Agric. Ibaraki Univ. 1953 : No. 1 : 11–15. [Japanese].

Fourteen samples from a wide range of hosts are differentiated into 7 groups on the basis of such characteristics as growth rate, optimum temperature for growth and coloration of the medium.

233 MATSUURA, Y. & TAKAHASHI, K.
(Studies on diseases of crop plants caused by *Rhizoctonia solani* Kühn. II. The pathogenicity of *Rh. solani* Kühn towards seeds and seedlings of a number of crop plants).
Ibaraki Daigaku Nogakubu Gakujutsu Hokoku/Sci. Rep. Fac. Agric. Ibaraki Univ. 1953 : No. 1 : 17–22. [Japanese].

The 14 strains mentioned above [232] were inoculated into soil in which germinating seeds of either bean, soya bean, cowpea, radish or cucumber were being raised. Differences between the strains in pathogenicity, especially as regards radish and cucumber, were noted. Some strains were more pathogenic at 20–30° C. and others at 15–20° C.

234 MATSUURA, Y. & TAKAHASHI, K.
(Studies on diseases of crop plants caused by *Rhizoctonia solani* Kühn. III. On strains of the fungus hindering germination of the grains of barley and *Setaria*).
Ibaraki Daigaku Nogakubu Gakujutsu Hokoku/Sci. Rep. Fac. Agric. Ibaraki Univ. 1953 : No. 1 : 23–24. [Japanese].

Using the same strains as in previous experiments [cf. 232–3], their effects on seedling emergence of barley and *Setaria* were studied. Strain 14, originally isolated from *Phaseolus vulgaris*, was the most virulent. Strain 7, isolated from potato, was pathogenic to barley, and strain 9, isolated from barley, was pathogenic to *Setaria*.

235 BŁASZCZAK, W.
Badania nad chorobotwórczością 8 szczepów *Rhizoctonia solani* Kuehn różnego pochodzenia. **(Studies on the pathogenicity of 8 isolates of *Rh. solani* Kuehn of different origin).**
Acta agrobot., Warszawa 1958 : **7** : 93–116.

Eight isolates of *Rh. solani* (*Pellicularia filamentosa*) from potato, swede, lupin, cauliflower and *Hydrangea hortensis* showed no physiological specialization but differed markedly in virulence, isolates Rh1 from *H. hortensis*, Rb14 and Rb21a from swede and Rk1 from cauliflower being strongly pathogenic on swede, cauliflower, cabbage and lupins.

236 YARWOOD, C. E.
Evolution of viruses in roots.
Plant Dis. Reptr. 1959 : **43** : 638–39.

A number of instances are cited of viruses which are commonly harmless parasites in plant roots, chiefly the tobacco viruses, while producing severe disease if infecting the foliage. This tolerance suggests the hypothesis that the viruses in question have evolved in plant roots, possibly from soil organisms. A comparison is drawn with *Pseudomonas* spp. which behave similarly. This hypothesis is analogous to that which supposes viruses to have evolved in their insect vectors, to which they are also relatively harmless.

CEREALS

237 PÉREZ-NAVARRO Y FLÓREZ-ESTRADA, A. & MATALLANA VENTURA, J.
Memoria de los trabajos realizados por la Sección de Cebadas y Avenas del Centro de Cerealicultura de Madrid durante el año 1957. **(Report on work carried out in the Barley and Oats Section of the Cereal Centre at Madrid in the year 1957).**
An. Inst. nac. Invest. agron., Madr. 1959 : **8** : 101–201.

Among barleys which did well in numerous local trials in Spain are Cerro and Berta. Gelbhafer [Yellow oats], Support, Esperanza [Hope] and H. Vilmorin B were among the most productive oat varieties in several localities.

238 SOZINOV, A. A. & LYZLOV, E. V.
[The breeding of cereal crops at the Svalöf institute (Sweden)].
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 6 : 68–71. [Russian].

An account of breeding work with wheat, oats, rye and barley at Svalöf is given.

239 **Annual Reports of the Department of Agriculture, Cyprus for 1957 and 1958. Annexure IV. Annual Reports on Crop Husbandry** : Pp. 103 + 43. (Mimeographed).

Wheat. Promising rust-resistant selections have been developed from crosses between local wheats and rust-resistant introductions and are to undergo yield tests.

Barley. B–55–22 (Athenais x Cyprus Black) gave consistently good yields under both irrigated and dryland conditions. Since it has outyielded both parents for three successive years, this selection is to be released when seed supplies permit.

240 Ševčuk, T. N.
(The breeding of cereal crops in Canada).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 10 : 125–31. [Russian].

This account of breeding of wheat, oats and barley mentions some recent Canadian cultivars of these crops, in particular new spring wheats resistant to *Puccinia* and *Cephus*.

241 Patterson, F. L. *et al.*
Small grain varieties for Indiana. Recommendations for 1959 and performance, 1954-58.
Res. Bull. Purdue Univ. 1959 : No. 670 : Pp. 19.

The performance, including yield per acre, lodging, plant height, maturation period and cold resistance, of varieties of spring and winter oats, winter wheat, winter barley and winter rye tested in several localities of Indiana is tabulated. Varieties recommended for growing in Indiana are described.

242 Avena, cebada y centeno. **(Oats, barley and rye).**
Idia 1959 : No. 135 : 1–48.

In addition to the details summarized below, information on the results of trials at various localities in Argentina is provided.

Oats. The crown-rust susceptible lines 0(13), 0(18) and 0(24) have been crossed with the highly resistant varieties Magnif 28 and Magnif 29 and Clinton Andrew [*sic*] at Pergamino. At Castelar, F_2 material from 0(18), 7(28) and 0(24)(22) crossed with Magnif 28 and Magnif 29, and from 0(13)(67) x Magnif 29, is under study.

Rye. The production of a synthetic combining the chief characteristics of Pico MAG and Forrajero Massaux [Massaux Forage] is in progress at Anguil. Pico is also undergoing colchicine and radiation treatment. *Secale turkestanicum* is expected to be useful as a source of resistance to shattering. Selection has resulted in the development of rust-resistant lines of biennial forage types of the variety Waldstauden.

Barley. At Anguil, a hybrid of *Osiris* x *Hordeum spontaneum* and Negra Manfredi [Manfredi Black] is under study; the first parent is resistant to races of mildew and *Rhynchosporium* but has poor agronomic characteristics, while the second is resistant to aphid and grows rapidly. At Bordenave, both Negra Manfredi and FAV 19 are being used as sources of aphid resistance. Among numerous crosses between forage types and mildew-resistant forms at Oliveros, (Primor x Trebi FCS) x Engledow India has yielded lines immune from mildew and resistant to *Rh. secalis*; of these, H24 F4–106/51–1–1, which is also good in fodder value, has been released under the name Oliveros Litoral MAG. Several F_1 selections from Brugger x Negra Pergamino, Brugger x Cheg 177 (Finley x Vaughn Smooth) and Trebi x Cheg 177 show high forage yields and resistance to *Helminthosporium* (*Pyrenophora*) *teres*. Some of these are being crossed with Engledow, which is resistant to *Puccinia anomala*, and those from Brugger x Negra Pergamino have been crossed with Ranquelina to improve their forage yield. At Tezanos Pinto, Hoyo Epuyén and San Carlos are being used as sources of resistance to *H. teres* in improving Negra Pergamino. The F_5 of (La Previsión 19 x *Hordeum spontaneum*) x RM 85 at Castelar includes lines combining resistance to *H. teres*, *Rh. secalis* and *E. graminis*. Material from Multan x Atlas is also resistant to the last two diseases and to aphid and gives good yields of grain and fodder.

243 Sortenbeschreibung. **(Varietal description).**
Dtsch. Landw., Berl. 1959 : **10** : p. 308.

Flämingsweiss 11 [Fläming White 11] was released in 1957. It originated from a cross of 151/36 (Lochow Gelb [Lochow Yellow] x Siegeshafer [Victory Oat]) x Flämingsgold and combines good quality with high productivity, surpassing the parental forms in yield and standing capacity. Also it is an undemanding variety. This variety has done well in all zones of the German Democratic Republic and is particularly suitable for combine harvesting. Petkus Moorroggen [Petkus Moor rye] is a special variety for peaty soils. It has a wiry stem which returns to an upright position after being beaten down by heavy rain.

244 Thorpe, H. C. & Dixon, G. E.
Cereals for 1959/60.
KIO Fortn. 1959 : No. 475 : Pp. 3.

[Cf. XXIX, 2408].

245 Trofimovskaja, A. Ja.
(Utilizing available resources for increasing the harvests of barley and oats).
Zemledelie (Agriculture) 1958 : No. 11 : 39–46. [Russian].

The breeding of improved varieties of the above crops adapted to the varied climatic and soil conditions in the Soviet Union is discussed in general terms. More extensive use should be made of hybridization employing foreign cultivars introduced by the Institute of Plant Industry. Some of these cultivars and a few Soviet standard varieties possessing valuable characteristics are listed. Among the latter are the drought-resistant oats Soviet and Har'kov 596, the early-ripening Sibirjak [oat from Siberia] and Hibiny 2, and a winter cultivar of *Avena byzantina*; the standards of forage and brewing barley include Viner, characterized by great plasticity in respect of growing conditions, Nutans 187, resistant to *Oscinella*, and the drought-resistant varieties Donec 50 and Europaeum 353/133.

246 Ingold, M. & Zweifel, J.
Les céréales cultivées en Suisse romande. **(The cereals cultivated in French-speaking Switzerland).**
Rev. rom. Agric. 1959 : **15** : 69–80.

Descriptive and comparative notes on wheat, rye, barley, oat and maize varieties are provided.

247 Pissarev, V. E.
Die Entstehung der ostsibirischen Gruppe frühreifer Sommerweizen. **(The origin of the east Siberian group of early ripening spring wheats).**
Z. Pflanzenz. 1959 : **41** : 227–52.

Morphological and physiological characters of *Triticum vulgare* var. *ferrugineum* f. *sibiricum* are described; it occurs in the region between Lake Baikal and Finland and was probably cultivated in this region before it was annexed by the Russians in the 17th century. In 1922, similar forms of wheat were cultivated throughout Mongolia; they occurred in mixtures with other wheats. It seems likely that the east Siberian wheat originated from China and it resembles Chinese spring wheat in being easily crossed with rye. There is also evidence that types of barley, oats, rye and millet reached east Siberia from China by way of Mongolia.

248 Trofimovskaja, A. Ja. & Luk'janova, M. V.
(Varietal characteristics of oat and barley in connexion with their utilization as green fodder).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1958 : No. 11 : 3–8. [Russian].

Growth periods, plant height, leafiness, green matter yield, rate of growth after the first cut and nutritive value of many oat and barley varieties from the collection of the Institute of Plant Industry were studied in the province of Leningrad. The results are discussed in relation to the relative value of some of these varieties as green fodder in the northwestern region of the USSR. Worth mention among the oats are Hibiny 2 and Nidar, which combine earliness with good leafiness and length of straw, and a wild oat (*Avena strigosa*) originating from France, which is highly productive of nutritious fodder, even when grown on poor or acid soil. The Soviet barley Poljarnyj 14 [Arctic 14], the Finnish Tammi and Canadian Naval are especially commended for producing green fodder very early in the season.

249 Bowden, W. M.
The taxonomy and nomenclature of the wheats, barleys, and ryes and their wild relatives.
Canad. J. Bot. 1959 : **37** : 657–84.

The genus *Triticum* is emended so as to contain (1) ten diploid species, viz. *T. monococcum* and nine species previously placed in *Aegilops* which are here designated *T. bicorne*, *T. speltoides*, *T. comosum*, *T. uniaristatum*, *T. longissimum*, *T. umbellulatum*, *T. tripsacoides*, *T. dichasians* and *T. aegilops*; (2) one allotetraploid species, *T. turgidum* (genome AABB and AAGG), comprising eight groups of cultivars, three botanical varieties (var. *dicoccoides*, *timopheevii* and *tumanianii*) and one autoallohexaploid (var. *timopheevii* f. *zhukovskyi*); and (3) one allohexaploid species (AABBDD), *T. aestivum*, a hybrid complex consisting of (*a*) six groups of cultivars (*aestivum*, *spelta*, *compactum*, *sphaerococcum*, *macha* and *vavilovii*), (*b*) ten other allotetraploid or allohexaploid species of interspecific-hybrid origin which were formerly assigned to *Aegilops* and (*c*) numerous other artificial and natural interspecific hybrids. The cultivated barleys and their wild relatives are all classified under a single species, *Hordeum vulgare*, represented by ssp. *spontaneum* vars. *spontaneum* and *ischnatherum*, ssp. *vulgare* var. *vulgare* f. *agriocrithon* and three groups of cultivars, viz. *vulgare*, *distichon* and *irregulare*, and their subgroups.

The current taxonomic situation in *Secale* is briefly discussed, pending completion of investigations on this genus.

250 Coïc, Y. & Coppenet, M.
Sur la carence en manganèse des céréales dans les sols humifères de Bretagne. **(On the deficiency in manganese of cereals on humous soils in Brittany).**
Ann. Inst. nat. Rech. agron., Paris : Sér. A. 1958 : **9** : Suppl. II : 111–38.

Differences in susceptibility to a manganese deficiency disease are reported for different cereals. Varietal differences were more marked in oats than in wheat.

251 Ruszkowski, M.
Studia nad gryką. Cz. VII. Badania nad uzyskaniem form gryki i prosa mniej wrażliwych na wiosenne chłody. (**Studies on buckwheat. VII. Investigations on obtaining forms of buckwheat and millet less susceptible to spring cold**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1958 : **2** : 687–95.

During the period 1952–57 at Puławy, Poland, it proved possible, by prewinter sowing, early spring sowing or vernalization, to obtain forms of millet and of buckwheat resistant to low spring temperatures. This improvement is ascribed chiefly to natural selection but the possibility of mutation is also considered. The superior productivity compared with the initial material was found in the selected buckwheat when sown in early spring, and in the selected millet when sown in early or late spring.

252 Bridgmon, G. H. & Wilcoxson, R. D.
New races from mixtures of urediospores of varieties of *Puccinia graminis*.
Phytopathology 1959 : **49** : 428–29.

The occurrence of genetic recombination between varieties of *P. graminis* during the uredial stage is reported for the first time. Mixtures of orange uredospores of race 11 of var. *tritici* and red uredospores of var. *secalis* were injected into the boots of barley plants, in which the recombination took place. Three new races were isolated from the wheat Little Club, which had been inoculated with uredospores from the barley plants. Each of the new races had red uredospores and attacked fewer of the differential hosts than the var. *tritici* parent but more than the var. *secalis* parent.

253 Gustavsson, A.
Fysiologiska raser av stråsädesrost i Sverige 1957. (**Physiological races of cereal rusts in Sweden, 1957**).
Bot. Notiser 1959 : **112** : 313–20.

The survey of Swedish cereal rust races for 1956 has been summarized previously [XXVIII, 245]; the following differences are recorded for 1957. Wheat leaf rust race 77 declined in frequency and race 57 took first place; races 20 and 107 are also reported. Oat stem rust race 3 was less frequent than in 1956 and races 6A and 7A more so. Race 297 of oat crown rust, known from one locality only, is reported.

254 Andersen, S.
Havreålens betydning og bekæmpelse. (**The importance and control of the oat nematode**).
Ugeskr. Landm. 1958 : No. 42 : Pp. 6.

The oat varieties Stål [Steel] and Örn [Eagle] are not resistant to *Heterodera schachtii* but are somewhat less damaged than Rex and Minor. There appear to be two types of the eelworm in Denmark, one able and the other unable to form cysts on the barley Drost [Seneschal]. Kronbyg [Crown barley] shows some resistance to both types.

WHEAT

255 Gadea, M. & Alonso Martínez, E.
Noveno año de experiencias con nuevas variedades de trigo. (1956–57). [**Ninth year of experiments with new wheat varieties (1956-57)**].
An. Inst. nac. Invest. agron., Madr. 1959 : **8** : 55–99.

In these trials [cf. XXVII, 2752], Dimas was first in productivity in nine and second in two out of 14 tests in different localities. Magdalena was best in two spring-sown trials. Results of further series of trials of unnamed hybrids are also presented.

256 Wintertarwe, 1959. (**Winter wheat, 1959**).
Landbouwvoorlichting **16** : Bijl. 54; Ber. Rassenkeuze 1959 : No. 271 : unpaginated.

A report on the performance of 28 varieties tested on various soil types in the Netherlands is presented. Among more recent varieties, MGH698, a high-yielding variety with short fine straw, and CIV237, which is particularly suited to the south-western clay soils, are both to be admitted to the official varietal list; both are fairly winter hardy.

257 Séguéla, J. M.
Enseignements à tirer de la campagne de céréales 1957–1958. (**Lessons to be drawn from the cereal season 1957-1958**).
Tunis. agric. 1959 : **60** : 13–32.

As in previous reports, the relative merits of wheats cultivated in Tunisia are discussed and mention is made of promising new varieties.

Sixteenth annual report on winter wheat improvement in Ontario. 1958 crop.
1959 : Pp. 16. (Mimeographed).

258 *Waddell, W. H. Winter wheat improvement at the Ontario Agricultural College.* (*pp. 1–3*).

Part 1 provides a report of winter-wheat breeding and testing at the Ontario Agricultural College, Central Experimental Farm and Harrow Research Station. Part 2 reports on a co-operative trial of 13 varieties and hybrids in six localities and the results of testing these entries for quality.

259 Izko, A. M.
(**How should the work of the State Varietal Commission be improved ?**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 6 : 54–57. [Russian].

In joining the discussion on the procedure of varietal testing, which has recently been critized by some Soviet writers, Izko disagrees with Ivanov that the breeding of new varieties should be left to plant breeders at institutes other than those responsible for varietal trials. In this connexion he refers to the rust-resistant spring wheat Monakinka, obtained by himself by single-ear selection from Thatcher, which has been heavily infested with rust in tests conducted in the Primor'e territory. The new variety has outyielded the standard Dal'nevostočnaja [Far-eastern] on the average by 2 c. per ha. at the Primor'e Agricultural Research Station and has better threshability and resistance to lodging.

260 Landi, R.
Notizie preliminari su prove di reincrocio come metodo di ulteriore miglioramento di varietà elette di grano. (**Preliminary report on tests of back crossing as a method of further improving selected varieties of wheat**).
Genet. agr. 1959 : **10** : No. 1–2 : 3–16.

Observations made on a number of intervarietal crosses and on their back crosses showed that colour of auricles in Falcone is dominant to its absence in S. Pastore and Mara, monohybrid ratios being observed. The same was true of the glume pubescence in Falcone. Glaucous leaves in Giuliari were incompletely dominant to nonglaucous in Libero, inheritance being again monofactorial. Susceptibility to *Puccinia triticina* was conditioned by two dominant genes in crosses of Mara x Falcone and by a single dominant in Giuliari x Libero. Cold resistance displayed complex inheritance and back crosses to the hardy variety S. Pastore had a higher proportion of hardy plants than back crosses to Falcone or Mara. A similar situation was encountered for height of plant.
No linkages were observed. After four generations of back crossing the hybrids resembled the recurrent parent almost completely and it has been possible by crossing Mara x S. Pastore and back crossing to Mara to raise the winter hardiness of Mara without changing its other characteristics. In the same way it has been possible to reduce S. Pastore in height by about 10 cm.

261 Schmalz, H.
Untersuchungen zur Vererbung des Sommer-Winter-Typus und der Winterfestigkeit, sowie morphologischer und ertragsphysiologischer Merkmale des Weizens. (**Investigations on the inheritance of the spring-winter type and of winter hardiness, also of morphological characters and of the physiological characters connected with yield of wheat**).
Kühn-Archiv 1958 : **72** : 435–37.

At the Plant Breeding Institute in Hohenthurm, the characters of 44 winter and spring varieties were studied in 65 different crosses. Varieties of *Triticum aestivum*, *T. durum* and *T. monococcum* were used in the studies of spring and winter habit. In the F_1 generation, the spring type tended to prevail and was completely dominant in one cross. In crosses of pure spring forms having no vernalization requirement with others showing the winter habit in varying degrees and also in crosses between varieties of *T. aestivum* differing in vernalization requirement, the segregation indicated that three genetic factors are involved. These factors are independent and differ in the strength of their effect; their action is additive. The development of the hybrids was influenced by the photoperiodic characters of the parent varieties. Pusa 4, Pusa 90 and Peko had the spring character strongly developed. Crosses between spring forms or between spring forms and others with a low vernalization requirement did not produce any winter forms in most cases. In a cross between spring and winter forms of *T. spelta* the segregation results indicated that the parents differed by a single factor. Other crosses between spring and winter forms within the species *T. durum* and *T. monococcum* gave bifactorial segregation.

As regards winter hardiness, no exact dominance relationship was found; F_2 progenies were intermediate between their parents in percentage winter survival. Some F_3 families combined the spring character with good winter hardiness. In F_3 plants of the cross Hadmersleben IV (winter type) x Pusa 4 (spring type), factors influencing yield seemed to be linked with those determining winter hardiness and vernalization response.

Red colour of the glume was found to be controlled by a single gene dominant to that responsible for white colour. The characters denseness of ear and vernalization behaviour combined freely in four crosses. The phenol reaction of the grain involved two factors with additive effect. As regards awnedness, there was monofactorial segregation and free combination between this character and spring or winter habit. In a cross of a winter variety of *T. spelta* with a spring form of *T. aestivum*, some plants with compactoid ears were obtained; this character was associated with loose closure of the glumes. The same variety of *T. spelta* gave no compactoid progeny in a cross with another variety of *T. aestivum*. Swedish land varieties were intercrossed and glume colour and hairiness were found to be linked.

262 GORIN, A. P.
Hibridarea naturală la grîu. **(Natural hybridization in wheat).**
An. Romîno-Soviet. : Ser. Agric. 1956 : No. 4 : 55–69.

[Cf. XXVI, 2172].

263 SILVELA Y DE TORDESILLAS, F.
Memoria del congreso del trigo duro y de las pastas alimenticias de Detmold. **(Report of the congress on hard wheat and macaroni products at Detmold).**
Bol. Inst. Invest. agron., Madr. 1959 : **19** : No. 40 : 119–33.

In addition to brief notes on the lectures and exhibits at the above congress, held on 24–25 February, 1959, a detailed report of an address by G. Fabriani on the breeding of *durum* wheats in Italy is given. On crossing the soft wheat Villa Glori ($n = 21$) with a *Triticum turgidum* with branched ears ($n = 14$), a hybrid combining the chief characteristics of *T. vulgare* with the high yield of *T. turgidum* was obtained. This was then crossed with *T. durum* ($n = 14$) and gave, in the F_4, numerous new *durum* types including plants with the desired characteristics of earliness, short straw and high fertility. Several F_6 plants are stable and very promising but are still to be tested for quality. Another cross, *T. durum* 'Capelli'* x *T. turgidum* 'Cignarella', has yielded F_1 plants combining the *durum* habit with the slow vegetative growth of *T. turgidum*; this type may allow the extension of *durum* cultivation further north.

264 FUKASAWA, H.
Nucleus substitution and restoration by means of successive backcrosses in wheat and its related genus *Aegilops*.
Japan. J. Bot. 1959 : **17** : 55–91.

The final analyses are presented of findings published in a series of papers already summarized in *Plant Breeding Abstracts*; some additional information is also given. When the *Triticum durum* genome was placed in *Ae. ovata* cytoplasm using *Aegilotricum* or *Ae. ovata* as the female parent, all the resulting plants were male sterile; they showed 14_{II}. This is considered to be a case of cytoplasmic male sterility and the male-sterile condition has been maintained completely unchanged in further generations back crossed with *T. durum* pollen. Crossing normal *T. durum* with a line containing *Ae. ovata* cytoplasm, restoring the *Ae. ovata* genome into *Aegilotricum*, restoring the *Ae. ovata* genome into the *Ae. ovata* cytoplasm of male-sterile *T. durum*, placing the *T. durum* genome into a hybrid of *T. durum* ♀ and *Ae. ovata* ♂, placing the *T. durum* genome into the amphidiploid of *T. durum* ♀ and *Ae. ovata* ♂, substituting the *Ae. ovata* genome into *T. durum* cytoplasm and restoring the *T. durum* genome into *Ae. ovata* plants with *T. durum* cytoplasm all resulted in plants with normal male and female fertility. F_1 hybrids between *Ae. ovata* and Emmer wheats usually had 28 univalents. Unreduced gametes were produced and cross over between chromosomes of *Ae. ovata* and *T. durum* was very rare.

Crosses between male-sterile *T. durum* and various Emmer wheats showed 14_{II} and became male sterile. However crosses between male sterile *T. durum* and *T. dicoccoides* var. *kotschyanum* yielded only fertile offspring. There is evidence that the pollen restoring factor of *T. dicoccoides* var. *kotschyanum* comprises two or more genes.

Triploid hybrids were obtained from crosses of male-sterile *T. durum* with *T. monococcum* or *T. aegilopoides*; they showed complete male and female sterility. Pentaploid hybrids resulted from crosses between male-sterile *T. durum* and the Dinkel wheats, *T. vulgare* and *T. compactum*; meiosis was normal but the hybrids produced no viable pollen. The pentaploid seeds from male-sterile *T. durum* x *T. spelta* shrivelled. Male-sterile *T. compactum* plants with *Ae. ovata* cytoplasm were crossed with Norin 26 [Ministry of Agriculture and Forestry 26], a Dinkel wheat; the resulting plants were vigorous but male sterile. Substitution of the genome of *Ae. variabilis* var. *intermedia* into *Ae. ovata* cytoplasm revealed that *Ae. ovata* cytoplasm did not bring about male sterility when combined with the *Ae. variabilis* genome. F_1 hybrids of *Ae. ventricosa* ♀ x Emmer wheats ♂ (*T. durum* and *T. dicoccoides* var. *spontaneo-nigrum*) and the reciprocal hybrids were crossed with *T. vulgare* var. *erythrospermum* ♂; the offspring showed a $21_{II} + 7_{I}$ configuration at metaphase I indicating the formation of unreduced gametes. Successive back crosses with *T. vulgare* pollen were carried out and the resulting 42-chromosome plants showed a 21_{II} configuration or modifications of it and fertility was nearly normal. No male-sterile condition was noticed in the offspring. It seems that in the back crosses not all the *T. vulgare* genes have been substituted into *Ae. ventricosa* cytoplasm.

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* ?Cappelli.

In the light of the above results, the relationships between genome and cytoplasm concerning male sterility are discussed. *T. turgidum* var. *nigro-barbatum*, *T. dicoccum* (Russian variety), *T. persicum* var. *stramineum*, *T. orientale*, *T. polonicum*, and *T. pyramidale* seem to possess the same genome constitution as *T. durum* var. *reichenbachii* as regards male sterility. The cytoplasms of *T. durum* and *Ae. ovata* appear to be different. Also cytoplasm of *Ae. caudata* differs from that of *T. vulgare*. The cytoplasm of *T. dicoccoides* var. *spontaneo-nigrum* does not have much effect on the genome manifestation of *T. vulgare* as regards male sterility. The cytoplasms of *Ae. ventricosa* and *Ae. ovata* differ in their effect on sterility; "the cytoplasm of *Aegilops* is very constant and cannot be altered by foreign *Triticum* genome". The fertility restoring genes of *T. dicoccoides* var. *kotschyanum* are thought to act by temporarily inhibiting the sterility-causing action of the cytoplasmic element. Plants with 14 bivalents of the *T. durum* genome and some extra chromosomes of *Ae. ovata* produce good pollen grains in amounts depending on the extra chromosomes and the environmental conditions. The fertility-restoring extra chromosome seems to exert its effect only in the sporophyte and not in the male gametophyte. The fertility-restoring chromosome may have some influence on the production or transmission of nutritive factors. "The partial pollen fertility of $14_{II} + x_{I}$ plants in the substitution lines is based on the combination of three possible factors; (1) a certain cytoplasmic element derived from *ovata* plants, (2) a pollen-restoring factor of extra-chromosomes from *ovata* plants, (3) meiotic irregularities brought about by univalents in the microsporocytes". It is tentatively suggested that the specific factor for sterility in *Ae. ovata* did not exist before a phylogenetic separation between *Aegilops* and *Triticum* took place from some unknown form. After this the sterility factors were produced by mutation in *Ae. ovata* cytoplasm.

In plants with cytoplasmic male sterility, meiosis appears to be normal and microspore development is normal up to germ-pore formation, also the tapetum is not abnormal. Proline was found to disappear and asparagine to accumulate in the anthers during pollen degeneration; there was also a deficiency of sucrose in male-sterile anthers.

In addition to male sterility, other abnormalities have been found in plants with foreign cytoplasm; these include retardation of vegetative growth, chlorophyll variegation and abnormal stomata. These characters did not segregate in subsequent progeny.

"The reciprocal difference of cross-compatibility between *ovata* and Emmer wheat was not due to the cytoplasm but to the incompatibility between the genome constitution of the pollen grains and the special status of the female sex organ".

265 NAKAJIMA, G.
(Cytogenetical studies on F_1 and F_2 plants of the intergeneric hybrid *Triticum vulgare* x *Secale cereale*.
Senshokutai (Chromosome)/Kromosomo
1958 : No. 39 : 1323–40. [Japanese].

Three wheat varieties, Norin 50 [Ministry of Agriculture and Forestry 50] and two unidentified strains referred to as A and C, were used as mother plants and pollinated with rye pollen. The number of F_1 plants per pollinated flower ranged from 8·49 to 19·60%. Morphological and cytological descriptions are given of the F_1 and F_2 hybrids obtained. The F_1 plants were highly sterile though up to eleven bivalents were formed in some cases with the mode ranging from 0_{II} to 6_{II}. A few fertile amphidiploids (modal metaphase configuration

$26\text{–}27_{II}$) and some chimeras were also obtained. The F_2 from amphidiploid florets comprised plants with chromosome numbers ranging from 54 to 59; F_2 progenies were also obtained from some of the comparatively sterile F_1 plants, the chromosome numbers in this case ranging from 42 to 55.

266 NAKAJIMA, G.
(The progeny of a haploid obtained from TdicSaF$_1$).
Senshokutai (Chromosome)/Kromosomo 1958 : No. 39 : 1341–44. [Japanese].

A 20-chromosome presumably parthenogenetic offspring had previously been obtained by the author after pollinating an F_1 hybrid of *Triticum dicoccum* x *Secale africanum* with pollen from *Haynaldia villosa* [XVIII, 275]. In the present paper, two offspring of this plant are described, with 41 and 42 chromosomes respectively, the modal bivalent frequency in each case being 20_{II}. Both morphologically and cytologically these plants resemble amphidiploids of *T. dicoccum* x *S. africanum.*

267 LOZANO, M. J.
El trigo perenne será de gran utilidad. **(Perennial wheat will be most useful).**
Rev. Inst. agríc. catal. 1959 : **108** : 57–60.

Reference is made to hybrids between *Triticum* and *Agropyron elongatum*, *A. trichophorum* and other *Agropyron* spp. produced in the USA at Davis, Calif. [cf. XXIX, 2457] and to the use of back crossing in the production of these wheats and of the variety Onas 53 [cf. XXIV, 2850].

268 **New wheats sought by USDA, state breeders.**
Crops & Soils 1959 : **11** : No. 10 : p. 27.

The aims of breeders of the US Department of Agriculture are outlined and mention is made of promising selections of wheat-*Agropyron* hybrids. Some progress has been made at the California Agricultural Experiment Station with the development of a perennial wheat from these hybrids; the first years' yield from this wheat equalled that from superior annual varieties. Some of the new hybrids have superior disease and insect resistance and one selection gives high-protein flour.

269 **Hybrid wheat shows great promise.**
World Fmg., Kansas City 1959 : **1** : No. 8 : 3–4.

Perennial hybrids of wheat and *Agropyron* species have been produced with a life of about four years, but with progressively decreasing yields after the first year. Some hybrids have shown high resistance to stem and leaf rusts, yellow-dwarf and streak viruses, mildew, smut, *Septoria* blotch, Hessian fly, joint worm and aphids and tolerance to drought. Though not commercially developed these hybrids are important for transferring the above desirable qualities into wheat and it is hoped to extend this work further.

270 TANAKA, M.
Newly synthesized amphidiploids from the hybrids, Emmer wheats x *Aegilops squarrosa* varieties.
Wheat Inform. Serv. Kyoto 1959 : No. 8 : p. 8.

Data are provided on the seed fertility of the following F_1 $3x$ hybrids when selfed and open-pollinated: crosses of *T. durum* and *T. persicum* var. *stramineum* with *Ae. squarrosa* var. *typica*; crosses of *T. dicoccoides* var. *spontaneo-nigrum*, *T. dicoccum*, *T. durum*, *T. persicum* vars. *stramineum* and *fuliginosum* and *T. orientale* with *Ae. squarrosa* var. *strangulata*; and crosses of *T. durum* var. *reichenbachii* and *T. persicum* var. *stramineum* with *Ae. squarrosa* var. *meyeri.* Pollen-fertility percentages are also given for some of the hybrids. It is stated that the seeds were the result of the union of unreduced gametes. *T. persicum* x var. *meyeri* and *T. persicum* x var. *strangulata* had the highest seed fertility. It is therefore regarded that these combinations are more likely to have played a part in the origin of the $6x$ wheats than the others.

271 ARMSTRONG, J. M. & HATTERSLEY-SMITH, M.
Polyspory in an amphidiploid of *Triticum-Agropyron* hybrids.
Canad. J. Pl. Sci. 1959 : **39** : 272–77.

A detailed account is given of a study which has already been briefly reported [XXIX, 930].

272 HLYSTOVA, A. F.
(The question of the mode of inheritance of characters in intraspecific hybridization of wheat).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1958 : No. 10 : 8–12. [Russian].

The F_1 and F_2 hybrids obtained by direct and reciprocal crossing of Lutescens 62 with Moskovka [wheat from Moscow] and Lutescens 62 with Moscow 2411 have been studied at Gorki Leninskie and the results provide a basis for a discussion of the problem of matrocliny. It was found that the progeny tended to resemble the ♀ parent in such characteristics as tillering, awns, average grain yield per plant and spring or winter habit.

273 Vettel, F.
Mutationsversuche an Weizen-Roggen-Bastarden (*Triticale*). **[Mutation experiments on wheat-rye hybrids (*Triticale*)].**
Kühn-Archiv 1958 : **72** : 445–47.

Triticale varieties which have been stable for many years were treated with X rays. The X_2 generation of *Triticale* 'Rimpau' showed a mutation rate of 51·9 per 100 X_1 ear progenies. The mutants included forms with chlorophyll defects, abnormal ears and awns; some were dwarfs and others flowered earlier or later than normal forms. The most frequent mutants were forms with dense ears and others with loose or speltoid ears. It appears that more variability can be produced by inducing mutation than by crossing different *Triticale* forms or by creating new ones. Most of the mutants were similar to the normal form in fertility, some being inferior; only a few showed improved fertility and these were all types with long dense ears.

Mutants of different *Triticale* varieties all had $2n = 56$. Univalents and multivalents were observed during meiosis.

274 Yamashita, K. & Sugino, M.
Temperature effect on plastid pigment accumulation in mutants of Einkorn wheat.
Wheat Inform. Serv. Kyoto 1959 : No. 8 : 1–2.

An account is given of the effects of temperature upon pigment production in two X-ray-induced mutants of *T. monococcum*, designated albino and carotina. Although chlorophyll accumulated in the two mutants when the seedlings were raised at 10° and above 20° C respectively, neither could be successfully cultured in a nutrient medium + sucrose.

275 Grünwald, C.
Influenţa alegerii genitorilor şi a educării în condiţii diferite de mediu asupra comportării unor hibrizi de grîu. **(The influence of choice of parents and of training under different environmental conditions on the behaviour of some wheat hybrids).**
An. Romîno-Soviet. : Ser. Agric. 1957 : No. 1 : 47–68.

F_1 and F_2 hybrids involving direct and reciprocal combinations of the varieties Lutescens 329 winter wheat, Moskovka 2411 [wheat from Moscow 2411] winter wheat, Lutescens 62 spring wheat and line 44, a spring wheat obtained by conversion of Lutescens 329 winter wheat, were raised at the Timirjazev Agricultural Academy during 1951–3. The F_1 plants were divided into three lots, grown respectively as winter, spring and greenhouse crops, and the progenies were treated similarly in the F_2. The F_1 of each cross was usually uniform, spring habit being dominant. Segregation usually but not always took place in the F_2. It is reported that more segregates with the winter habit appeared in the F_2 when (1) the spring parent was of less stable hereditary constitution, (2) when a winter-wheat variety was used as maternal parent, or (3) the F_1 was sown as a winter crop.

276 Laskin, V. P.
(Changing spring into winter wheat under the conditions of the South-east).
Agrobiologija (Agrobiology) 1958 : No. 6 : 54–60. [Russian].

An account is given of experiments at Saratov on changing the habit of the spring wheats Saratov 29, Lutescens 53/12, Lutescens 62, Lutescens 758 and Lutescens 1434 along lines recommended by Lysenko [cf. XXIII, 205]. Some winter wheats which are said to be hardier than the standard varieties without being inferior in other economic characteristics were obtained.

277 Fainbron, B. D.
Transformarea grîului de primăvară care nu iernează, în grîu toamnă rezistent la ger, ca metodă de creare a materialului iniţial pentru selecţie. **(Transforming a spring wheat which fails to overwinter into a frost-resistant winter wheat as a method of producing initial material for breeding).**
An. Romîno-Soviet. : Ser. Agric. 1957 : No. 1 : 69–78.

[Cf. XXVII, 1600].

278 Dimitrov, D.
(The wheat variety 301).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1958 : No. 12 : 22–23. [Bulgarian].

The above variety has outyielded 14, 159 and Sadovo in most seasons in trials at Pozdin, Pleven province, carried on from 1953 to 1958. Its valuable characteristics include winter hardiness, resistance to drought and lodging and good tillering capacity. By comparison with 14 it has a longer ear, larger grain and a greater number of productive spikelets and grains per ear.

279 NEZAMUDDIN, S. & FLORA, J. S.
Two better wheats come to Bihar.
Indian Fmg. 1959 : **9** : No. **3** : p. 10.

Two new rust-resistant varieties, NP798 and NP799, show an increase in yield over NP52, the standard variety, by about 16–20% in northern Bihar, 6½–9½% in southern Bihar and 1–6% in the hilly tracts of Chhotanagpur. NP758, NP761 and BR319 also proved promising in this latter area. NP798 and NP799 mature about 112 to 115 days from sowing, while NP761 and BR319 mature after about 109 to 111 days.

280 SINGH, G. & SAINI, S. S.
A new wheat finds a home in Kangra hills.
Indian Fmg. 1959 : **9** : No. **4** : 7–8.

C253, a cross of 25C and IP165, has been gaining popularity in the Kangra hills of the Punjab. It is completely resistant to yellow rust, moderately resistant to black and brown rusts and fairly resistant to smuts and bunts. C253 is an awnless type ripening well ahead of local bearded varieties and at Nagrota it has outyielded the local awnless varieties by more than four maunds per acre. The stem is fairly strong and resistant to lodging.

281 THORPE, H. C. & DIXON, G. E.
New cereal varieties, 1959.
KIO Fortn. 1959 : No. 477 : unpaginated.

[Cf. XXIX, 3678].

282 **Handbook of Canadian cereal varieties of barley, field beans, flax, oats, spring wheat and winter wheat.**
Plant Products Division, Production Service Department of Agriculture, Ottawa 1959 : unpaginated.

A description of the recently licensed spring wheat Kenhi [XXIX, 2473] has been issued for inclusion in the Handbook of Canadian cereal varieties [cf. XXII, p. 469].

283 JENSEN, N. F. & TYLER, L. J.
Avon wheat.
Fm. Res. 1959 : **25** : No. 2 : 2–3.

This new wheat developed at Cornell University Agricultural Experimental Station is resistant to loose smut, common bunt and dwarf bunt. Its yield in bushels/acre is almost equal to that of Genesee and its test weight is greater, its straw shorter and its lodging resistance better. Its parentage includes Genesee, Nured, Hussar x Yorkwin, Honor and the rye variety Rosen.

284 Carlo Gallini, un nuovo frumento.
(Carlo Gallini, a new wheat variety).
G. Agric. 1959 : **69** : p. 245.
Il nuovo frumento Carlo Gallini. **(The new wheat Carlo Gallini).**
Sementi elette 1959 : **5** : 69–70.

The wheat described is a selection from a cross of S. Pastore x Carme Jacometti; it is a winter wheat as early as S. Pastore in maturity and resistant to smuts, rusts, lodging, shedding and excessive heat and produces flour of high quality.

285 MELEŠKIN, A.
(Priekuļi wheat).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. **11** : 38–39. [Russian].

Priekuļi 481 was selected from a *lutescens* form at the Priekuļi Research Station. It outyields the winter wheat standard Kursas and also wheat-*Agropyron* hybrid 1 in many districts of Latvia and is characterized by great winter hardiness. Its baking and milling properties are good and the 1000-grain weight is 36–42 g. The ears are of cylindrical shape and 8–9 cm. long and have 14–17 spikelets.

286 LATYPOV, A.
(Experimental work on a collective farm).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1958 : No. 12 : 41–42. [Russian].

The wheats Batkan Belaja [White Batkan] and Batkan Krasnaja [Red Batkan], which have been introduced into the Frunze province from Preževal'sk outyielded all other varieties tested, including the standard Erythrospermum 115 to which they are also superior in resistance to lodging and *Puccinia*. Batkan Belaja was the more productive of the introductions and had the larger grain.

287 GOL'BEK, A. K.
(Accelerating the change to sowing varietal seed).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : **6** : 27–30. [Russian].

Measures designed to improve the supply of seed of improved varieties, in particular the seed of the new spring wheat Krasnaja Zvezda [Red Star], in Kazahstan are discussed. This variety has good baking and milling properties, outyields the previous standard variety Pseudoturcicum 2115 and shows improved resistance to rust.

288 Kuckuck, H.
Neuere Arbeiten zur Entstehung der hexaploiden Kulturweizen. **(New studies on the origin of hexaploid cultivated wheats).**
Z. Pflanzenz. 1959 : **41** : 205–26.

The origin of hexaploid wheats is discussed in detail with reference to recent work. It is thought that the hexaploids probably have a genome A originating from *Triticum boeoticum* or *T. monococcum*, a genome B from *Aegilops bicornis* or *Ae. speltoides* and a genome D from *Ae. squarrosa*. Evidence supporting this view has been obtained from genetical analysis of the genomes, the pairing relationships between different genomes and from the artificial synthesis of tetraploid and hexaploid amphidiploids.

T. spelta is considered to be the original form of hexaploid cultivated wheat. There are various ways by which naked wheat could have originated from spelt wheat. For example, crossing different forms of *T. spelta* yields various naked types with a tough rachis; these are very similar to some of the more or less dense-eared types of cultivated wheat. Other problems which require further investigation are also mentioned. It is suggested that amphidiploids ($2n = 42$) of *T. carthlicum* (= *persicum*) x *Ae. squarrosa* should be made on a large scale using many different lines for it is known that lines of *Ae. squarrosa* collected in Pakistan, Afghanistan and Iran have shown resistance to *Puccinia triticina* and *P. graminis* and much variation in morphological and phenological characters. Also amongst the forms obtained by crossing different spelt wheats some interesting breeding material has been obtained. For example the types which have a tough rachis and a tightly closed glume would be suitable for combine harvesting.

289 Krustyn', A. O.
(The productiveness of winter wheat plants differing in respect of tillering).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 12 : 53–56. [Russian].

Good tillering capacity was positively correlated with high yield in the wheats Kursas, Ostka [Awned] and Hybrid 1 in experiments conducted in Latvia.

290 Kaniewski, K. & Mazurowa, J.
Badania porównawcze nad budową anatomiczną plew niektórych gatunków pszenicy.
(Comparative investigations on the anatomical structure of the glumes in some wheat species).
Hodowla Roślin Aklimatyz. Nasiennictwo 1959 : **2** : 725–69.

On the basis of differences in keel form and in lignification in the glumes of *Triticum monococcum*, *T. dicoccum*, *T. durum*, *T. polonicum*, *T. pseudopolonicum* and *T. polonicoides*, it is concluded that *T. polonicum* is closest to *T. durum*, while *T. polonicoides* and *T. pseudopolonicum* are closest to *T. dicoccum*.

291 **1958 Report of the Grain Research Laboratory, Board of Grain Commissioners for Canada, Winnipeg, Manitoba.**
1959 : Pp. 76.

Part I gives a report of technological investigations on hard red spring wheat, durum wheat for semolina and macaroni and malting quality in barley, including methods of evaluating breeders' material. Part II summarizes the results of quality tests on new and standard varieties of these crops.

292 Sudnov, P. E.
(Expanding grain production of "strong-floured" and hard wheats).
Zemledelie (Agriculture) 1958 : No. 12 : 28–31. [Russian].

An extension of the area under the above kinds of wheat in the USSR is urged, and the principal varieties of these wheats at present cultivated there are listed. The strong-floured wheats comprise 9 spring and 7 winter varieties, including the spring varieties Saratov 29, Saratov 210, Caesium 94 and Bezenčuk 98, and the winter varieties Novoukrainka, 84, Bezostaja 4 [Awnless 4] and Priazovskaja, which have been bred in recent years. The following new hard wheats are also mentioned: Melanopus 26, Čakinskaja 226 [Čakvi 226], Kubanka 3 [wheat from the Kuban' 3] and Krasnyj Kut. A few other varieties distinguished by winter hardiness, drought resistance or earliness are referred to briefly.

293 Livanov, K. V.
(Cultivating hard and "strong" wheats in the Zavolž'e).
Zemeledelie (Agriculture) 1958 : No. 12 : 31–37. [Russian].

Agronomic measures intended to improve the yields of hard and strong-floured wheats in the above region are discussed. Breeding new varieties with higher yields than the older varieties is recommended. In this connexion mention is made of the hard wheat Melanopus 26 from Krasnyj Kut, which outyields Melanopus 69, an earlier cultivar from the same breeding station; also of a new highly productive strong-floured wheat Saratov 210. [Cf. 292].

294 LISENKOV, A.
(Extending the area under hard and strong-floured wheats).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1958 : No. 12 : 23–24. [Russian].

The high quality of macaroni made from hard wheats and of bread baked from strong-floured wheats, by comparison with the products from ordinary bread wheats, is discussed and increased production of hard and strong-floured wheats is advocated. Some of the 43 hard wheat standards and 16 strong-floured standard varieties, some of them with fairly high yields, are mentioned. The need for breeding new varieties of these types with higher yields is emphasized.

295 PISAREV, V. E. & SAMSONOV, M. M.
(What is new in breeding high-protein and strong-floured wheats).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : **6** : 9–11. [Russian].

The new wheats 42H19, 62H19 and 21H19 were obtained by crossing the wheat-rye amphidiploid 25AD20/1–60 with the spring standard Moskovka [wheat from Moscow], with the amphidiploid serving as ♀ parent, at Nemčinovka [cf. XXVIII, 281]. The new forms are strong-floured wheats with appreciably higher protein and gluten contents than Moskovka and superior to it in baking quality.

296 WIDDOWSON, F. V.
The effects of nitrogen upon three stiff-strawed winter wheat varieties.
J. agric. Sci. 1959 : **53** : 17–24.

Experiments carried out in Hertfordshire and Bedfordshire showed that varieties vary considerably in their efficiency in utilizing fertilizer nitrogen: in this respect, Hybrid 46 was the best of the varieties tested.

297 FIRMIANI, G.
Produzione di grano triplicata con la semina di due cultivar. **(Trebled wheat production by sowing two cultivars).**
G. Agric. 1959 : **69** : p. 318.

By mixed sowing of two varieties differing in maturation period, culm length and nutritional requirements, e.g. Falcone [Hawk] and Frassineto, or Funo and Frassineto, F. Di Nola has obtained yields of 66·65 q./ha. at Amorosi, Benevento, in contrast to the normal production of 15–18 q./ha.

298 RAČINSKI, T.
(How wheat overwinters in the province of Trojan).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1958 : No. 12 : 24–26. [Bulgarian].

In studies of overwintering capacity, 10 varieties were classified into groups according to their responses to warm weather in winter. Two groups of varieties, each with a short dormancy period, resumed growth during the warm spells. The third group, which included 301 and Tolbuhin 10 and had a long dormancy period, showed no response to warmth until the dormant period was over. The percentages of survival for all three groups in the winters of 1956–57 and 1957–58 are shown in a table. Paradoxically, Tolbuhin 10 and 301 had the lowest survival ratios. Tabulated information is also provided on the effects of (1) manurial treatment and (2) wider spacing on improvement of the survival rate of four varieties.

299 MAMONTOVA, V. N.
(The breeding of spring wheat for drought resistance in conjunction with other economically valuable properties).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : **6** : 12–17. [Russian].

An account of breeding drought-resistant varieties with high quality grain at Saratov since 1911 is given and many wheats obtained by selection, hybridization or multiple hybridization are described. Most of the recent varieties, such as Albidum 43 and Steklovidnaja 1 [Vitreous 1], were obtained by the last method and a scheme showing how these two varieties were bred is presented. Several other varieties resulting from multiple hybridization are said to combine strong flour with high yield and resistance to drought, shedding and *Ustilago*.

300 ABDUL HAFIZ & CHAUDHARY, A. R.
Occurrence, perpetuation and control of bunt of wheat.
Agriculture, Pakistan 1959 : **10** : 149–58.

The reaction of 53 varieties to bunt (*Tilletia tritici*) varied not only with location but also with sowing date. At Kulu none of the varieties was resistant, but at Lyallpur some of the varieties can be considered as resistant.

301 KENDRICK, E. L.
The mineral oil seal method for maintaining cultures of *Tilletia caries* for long periods.
Phytopathology 1959 : **49** : p. 454.

Research on the physiological specialization and genetics of *T. caries* requires that large numbers of monosporidial lines be maintained in culture, often indefinitely. It has been found that monosporidial isolates may be maintained successfully under a mineral oil seal for at least 3½ years. Some lines from a given spore may however shift from sporidial to mycelial growth after storage. If the sporidial type of growth is to be produced, several replications should be kept under oil and transfers made at least once every 2 years. Sex compatibility relationships did not undergo any change as the result of storage.

302 KNOTT, D. R.
The inheritance of rust resistance. IV. Monosomic analysis of rust resistance and some other characters in six varieties of wheat including Gabo and Kenya Farmer.
Canad. J. Pl. Sci. 1959 : **39** : 215–28.

In order to determine the chromosomes carrying the seven genes *Sr*6-*Sr*12 controlling resistance to rust, each of 21 Chinese monosomics and normal Chinese were crossed with the varieties Gabo, Kenya Farmer, Egypt Na95 and Veadeiro. In addition Lee was crossed with mono-X and mono-VIII and Red Egyptian with mono-XX. The F_2 populations from the crosses were tested with either or both races 15B and 56 and in some cases were classified for other characters. The locations of genes *Sr*6, *Sr*9, *Sr*11 and *Sr*12, already determined by other authors, have been confirmed as follows: (1) *Sr*6 on chromosome XX in Red Egyptian, (2) *Sr*9 on XIII in Red Egyptian, Kenya Farmer and Veadeiro and (3) *Sr*11 and *Sr*12 on X in Gabo and Lee. Gene *Sr*7 was found on VIII in Kenya Farmer, Egypt Na95 and Kenya Governor, but no evidence of linkage was found with the gene *Hd* for hoods. The location of *Sr*10 is in doubt.

303 VOJTČIŠINA, O. N.
(Improving the resistance of wheat to rust by extra root feeding).
Agrobiologija (Agrobiology) 1958 : No. 6 : 138–40. [Russian].

Wheat hybrids from North Osetia were trained for resistance to *Puccinia glumarum*, *P. triticina* and *P. graminis*. The method consisted of spraying the hybrids with potassium chloride and superphosphate solutions 7–10 days before earing for several generations. The effect of the treatment is said to be heritable.

304 PRUCKOV, F. M.
(The cultivation of wheat in China).
Zemledelie (Agriculture) 1958 : No. 11 : 81–84. [Russian].

Pi-ma 1 and five other Chinese cultivars which have appreciably higher yields than the local varieties and show improved resistance to disease are mentioned. Pi-ma 1 is noted for winter hardiness, large grain and resistance to *Puccinia glumarum*.

305 THORPE, H. C.
Plant breeding notes.
Kenya Frmr. 1959 : No. 38 : p. 9.

A new wheat strain, Africa-Mayo, about to be released, was heavily infected with stem rust at Naro Moru. This strain had formerly proved resistant and on account of this attack its future is uncertain.

306 FREITAS, A. P. DO C. E
Puccinia rubigo-vera Tritici. II. Novas raças fisiológicas de *Puccinia rubigo-vera* f. sp. *Tritici* (Erikss. & Henn.) Carl., isoladas em Portugal. [***P. rubigo-vera Tritici.* II. New physiological races of *P. rubigo-vera* f. sp. *Tritici* (Erikss. & Henn.) Carl. isolated in Portugal**].
Agron. lusit. 1955 : **17** : 231–39.

Five races new to Portugal were isolated in 1954. Three of them, 3, 4 and 68, are known from elsewhere, one, A, may be identical with 143, while the remaining one, B, could not be identified with any previously known race.

307 FREITAS, A. P. DO C. E
Puccinia rubigo-vera Tritici. III. Diferenciação fisiológica do inóculo natural de *Puccinia rubigo-vera* f. sp. *Tritici* (Erikss. & Henn.) Carl., colhido em 1954 e grau de resistência em plantas jovens de trigos. [***P. rubigo-vera Tritici.* III. Physiological differentiation of the natural inoculum of *P. rubigo-vera* f. sp. *Tritici* (Erikss. & Henn.) Carl. collected in 1954 and the degree of resistance in young wheat plants**].
Agron. lusit. 1955 : **17** : 241–62

Eleven races, 3, 4, 11, 68, 74, 75, 84, 87, 107, 143 and B [cf. 306], were prevalent in Portugal during 1954. A large series of wheat varieties was tested for reaction to races, 3, 4, 68, 75, 76, 78, 84, 87 and B and the following were noted as resistant: *Triticum aestivum* 'Batisti', 'Hard Federation' and 'Riccio Strampelli'; *T. durum* 'Dur de Naples' [Naples Hard], 'Fanfarron', 'Mourisco' [Moorish], Tremês rijo [Strong Tremês] and Xérès; *T. pyramidale* 'Egipto'; and *T. dicoccum* 'Aggia'.

308 Santiago, J. C.
Epidemiology of wheat stem rust in Portugal.
Agron. lusit. 1955 : **17** : 275–95.

This study includes data on the relative abundance of the races of *Puccinia graminis* var. *tritici* in Portugal in 1951. The most prevalent races were 21, 16, 14 and 75; also present were 24, 34 and 40 and an unidentified race. Races 14, 16, 21 and 75 were clearly differentiated into subordinate biotypes.

309 **A proposed modification of the system of wheat leaf rust race identification and nomenclature.**
Plant Dis. Reptr. 1959 : **43** : 613–15.

A new system for wheat rust race nomenclature is proposed which includes an indication of reaction to supplementary differentials as well as to the standard differentials already in use. According to this system the designation of a race will consist of three parts separated by hyphens: firstly the race number determined on the basis of the reaction to the eight standard differentials; secondly the designation for a specific set of supplementary differentials indicating their area of acceptance and the year in which the list of varieties included in the specific supplementary differential set was published; and thirdly a number to indicate the culture producing a certain specific reaction on the supplementary set of differentials.

310 Kenaschuk, E. O., Anderson, R. G. & Knott, D. R.
The inheritance of rust resistance. V. The inheritance of resistance to race 15B of stem rust in ten varieties of durum wheat.
Canad. J. Pl. Sci. 1959 : **39** : 316–28.

The ten *Triticum durum* varieties studied fell into three groups. The first group contained six varieties, Amarai bianco tipo from Portugal and St.464, CI7805, CI7870, CI7875 and CI8133 from Ethiopia. All six carried two genes, *Srd*2 and *Srd*5, which were additive in effect and together conditioned a very high degree of resistance to race 15B. The second group comprised Arabian, Roja de Almería [Almería Red] and Golden Ball, each of which possessed *Srd*4, a gene for moderate resistance. Arabian also carried *Srd*5. The third group was represented by the Portuguese variety Camadi Abdu tipo 103, having a single gene, *Srd*6, which conferred good resistance.

311 Overlaet, J.
Épidémiologie de la rouille noire sur blé (*Puccinia graminis tritici* Erikss. et Henn.) et moyens de lutte dans les conditions culturales de Belgique. [**Epidemiology of black rust on wheat (*P. graminis tritici* Erikss. et Henn.) and measures of control under the cultural conditions of Belgium**].
Agricultura, Louvain 1959 : **7** : 255–67.

The tests of resistance described indicate that most wheats cultivated in Belgium are susceptible to this rust but winter varieties have a greater chance of escaping an attack than spring varieties because they mature earlier and the rust appears late in Belgium. It is suggested that stem rust might be efficiently controlled by breeding for earliness, especially in spring varieties.

312 Lange - de la Camp, M.
Gewächshausinfektionen mit *Cercosporella herpotrichoides* Fron. (**Glasshouse infections with *C. herpotrichoides* Fron**).
Z. Pflanzenz. 1959 : **41** : 294–304.

Different techniques for artificial infection were tried using vernalized plants of the winter wheats Hadmersleben IV, Hybrid II and Derenburger Silber [Derenburg Silver]. On the whole better results were obtained at 10° C. than at 15° C. Also it was found that placing the pathogen on top of the soil was more effective than putting it in the soil. It is thought that this procedure will also be useful in testing other host plants.

313 Koppányi, T. & Kovács, B.
Szalmadarázs-fertőzöttség vizsgálata különböző búzafajtákon. (**Investigations on infection by stew sawfly in different wheat varieties**).
Debrecen. mezőgazd. Akad. Tudomány. Évk. 1957 (1958) : 291–96.

In tests of Hungarian and introduced varieties, the former showed less attack by *Cephus pygmaeus* than the latter, Gödöllő 15 being the least susceptible with 2·92% infection.

314 McNeal, F. H., Berg, M. A., Hanson, W. D. & Luginbill, P. (Jun.).
Breeding for resistance to the wheat stem sawfly.
Agron. J. 1959 : **51** : 395–97.

F_2 and F_3 progenies from crosses of Rescue and

Selkirk with PI156219–9 and PI56229–2 were exposed to heavy infestation with sawfly (*Cephus cinctus*) at Choteau, Mont. The data showed that little, if any, progress may be expected in developing resistant varieties by selecting in the F_2 on the basis of stem solidity or sawfly cutting. Although sawfly resistance is doubtless heritable, its measurement is masked by environmental variability and by the interaction year x genotype. Ratings for solidity provided, however, slightly more indication of cutting in the F_3 than solidity in the F_2. It is suggested that, in evaluating a segregating population for resistance, it would not be essential to grow the F_2 under conditions of a heavy infestation. Each F_2 plant could be easily scored at harvesting for solidity by making one cut in the bottom internode, only plants with a desirable rating being saved. Resistance to the pest could then be determined from an F_3 progeny row exposed to a heavy infestation.

315 LEPIN, T. K. & PASTUŠENKO-STRELEC, N. A.
(Resistance of spring wheat to frit fly).
Bjull. glavnogo Bot. Sada (Bull. princ. Bot. Gdn.), Moskva-Leningrad 1959 : No. 33 : 107–09. [Russian].

Under conditions of severe natural infection, *Triticum aegilopoides*, *T. timopheevi*, *T. dicoccoides*, *T. dicoccum* and *T. persicum* remained free from attack, as did certain ecotypes of *T. durum*. A relatively high degree of resistance was observed in some ecotypes of *T. compactum* and a few of *T. vulgare*.

316 KIHARA, H., YAMASHITA, K. & TANAKA, M.
Genomes of 6*x* species of *Aegilops*.
Wheat Inform. Serv. Kyoto 1959 : No. 8 : 3–5.

The text is given of a paper read at the tenth International Genetics Congress in 1958 and dealing with the genomes of *Ae. crassa*, *Ae. juvenalis* and *Ae. triaristata* [XXIX, 1022].

317 MATSUMOTO, K.
Morphology of *Aegilops* F_1 hybrids with reference to genome differentiation.
Wheat Inform. Serv. Kyoto 1959 : No. 8 : 5–6.

A further and more detailed summary is given of a paper read at the tenth International Congress of Genetics in 1958 [cf. XXIX, 1048].

318 KIHARA, H., YAMASHITA, K. & TANAKA, M.
List of the collected material of *Aegilops* in Pakistan, Afghanistan and Iran, by KUSE, 1955.
Wheat Inform. Serv. Kyoto 1959 : No. 8 : 11–19.

A list is given of the representatives of *Ae. squarrosa*, *Ae. crassa*, *Ae. juvenalis*, *Ae. umbellulata*, *Ae. cylindrica*, *Ae. triuncialis*, and *Ae. columnaris* collected during the Kyoto University Scientific Expedition (KUSE) in 1955.

319 YAMASHITA, K.
Specification of the Botanical Mission of the University of Kyoto to the Eastern Mediterranean Region.
Wheat Inform. Serv. Kyoto 1959 : No. 8 : 20–23.

Information is given on the aims and proposed itinerary of the above expedition, expected to be made in 1959. One objective is collection of *Aegilops* with a view to elucidating the origin of Emmer wheat.

320 TANAKA, M.
Growing habit of *Aegilops crassa* strains collected in Afghanistan and Iran.
Wheat Inform. Serv. Kyoto 1959 : No. 8 : 6–8.

Twenty-three of the 58 4*x* and 6*x* strains of *Ae. crassa* collected in 1955 were studied with respect to growth habit at Kyoto, Japan. They were either of the spring or intermediate type, none of the strains showing winter growth.

BUCKWHEAT

321 BORATYŃSKA, W.
Studia nad diploidalną i tetraploidalną formą gryki zwyczajnej (*Fagopyrum sagittatum* Gilib.). **[Studies on diploid and tetraploid forms of common buckwheat (*F. sagittatum* Gilib.)].**
Biul. Inst. Roślin leczn. 1959 : **5** : 54–62.

Eight colchicine-induced autotetraploids studied in the C_1 had larger but fewer flowers, pollen grains and fruits than the diploids and showed a higher degree of sterility. The vegetative and flowering periods were longer.

OATS

232 **Goodfield is new lodging-resistant oat.**
Crops & Soils 1959 : **11** : No. 10 : p. 27.

Developed at the Wisconsin Agricultural Experiment Station, Goodfield is a short, stiff-strawed variety adapted to highly fertile soils where lodging is a problem; its yield is poor on fields of medium or low fertility. It is resistant to prevalent races of stem and leaf rust but rather susceptible to late races of these diseases. Goodfield is similar to Clintland and Beedee in resistance to *Septoria* and a small amount of smut was found on Goodfield after artificial inoculation. The parentage of Goodfield includes Hawkeye, Victoria, Garry and Clintland.

323 SCHMIDT, J. & DREIER, A. F.
New oat variety for Nebraska.
Neb. Exp. Sta. quart. 1959 : **6** : No. 1 : 10–11, 16.

Released by the University of Nebraska College of Agriculture Experiment Station, Nehawka equals Andrew in bushel yield, and is earlier and slightly shorter than Nemaha, which it equals in bushel weight and straw stiffness. It resists stem rusts 7, 7A and related races but not race 8. It also shows some tolerance of crown rust and is resistant to Victoria blight.

324 CALDECOTT, R. S., STEVENS, H. & ROBERTS, B. J.
Stem rust resistant variants in irradiated populations—mutations or field hybrids ?
Agron. J. 1959 : **51** : 501–03.

Seeds of Markton, an oat susceptible to all races of oat stem rust, were subjected to thermal-neutron bombardment. One lot of N_1 plants was grown under isolated conditions and a second lot without isolation. N_2 progenies from both lots were exposed to an epiphytotic of race 2 of oat stem rust. No resistant variants were found in the N_2 from the isolated N_1 but numerous resistant variants appeared in the N_2 from the lot grown without isolation. These resistant plants did not however possess the Markton phenotype in several respects. It is therefore suggested that they arose through chance hybridization in the field. The bearing of this result upon breeding by means of the radiation technique is considered.

RYE

325 Winterrogge, 1959. **(Winter rye, 1959).**
Landbouwvoorlichting **16** : Bijl. 53; Ber. Rassenkeuze 1959 : No. 270 : unpaginated.

Data and notes on the performance of eight varieties on different soil types in the Netherlands are given.

326 OBERDORF, F.
(The methods of breeding rye in the German Democratic Republic).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 11 : 102–06. [Russian].

Breeding methods employed at the Plant Breeding Institute in Bernburg and the Petkus Seed Farm in East Germany are described. The principal characteristics are rigorous selection, the remnant method, establishment of clones, continuous selection of clones and hybridization between selected pairs of clones. Mention is also made of breeding work on tetraploid rye.

327 MOLDENHAWER, K.
Nowa forma żyta kopalnego (*Secale cereale* L. ssp. *ancestrale* Zhuk. var. *afghanicum* Vav.) w wykopalisku na ziemiach Polski. **[A new form of fossil rye (*S. cereale* L. ssp. *ancestrale* Zhuk. var. *afghanicum* Vav.) found in an archeological excavation in Poland].**
Acta agrobot., Warszawa 1958 : **7** : 149–52.

A form of rye found in an archeological excavation near Cracow has long slender grains, clearly distinguishable from the short, thick grains of forms found previously in Poland. It dates from the period 400–0 BC and appears to be of the Afghanistan type. From a survey of the literature the author concludes that it is of Roman origin and may be evidence for Roman influence reaching southern Poland.

328 SYBENGA, J.
Some sources of error in the determination of chromosome length.
Chromosoma 1959 : **10** : 355–64.

Measurements of metaphase chromosomes in root tips of rye were made. Direct measurement with an ocular screw micrometer and measurement from a photograph, using a 100x oil-immersion lens in both cases, were equally accurate, giving a coefficient of variability of 0·6%. Measurement from a photograph taken with a 40x dry lens gave a coefficient of about 2·2%, which may cause serious errors for chromosomes smaller than those of rye. Accuracy may be increased by repeating the measurement on the photograph rather than by retaking the photograph. Hard squashing compared with moderate squashing generally increased chromosome length by several per cent, but the amount, although significant, varied between chromosomes and even between homologues. Squashing also increased, slightly but significantly, the ratio of the long arm to the short. Both these effects appeared to be smaller than the variability already present. Pretreatment with colchicine has a stronger contracting effect than that with oxyquinoline or bromonaphthalene. None of the pretreatments significantly altered the arm-length ratio, but differences between treatments were greater than those between plants.

329 AGUADO MARÍN, M.
Efectos del fósforo radiactivo sobre plantas de centeno. (**Effects of radioactive phosphorus on rye plants**).
Bol. Inst. Invest. agron., Madr. 1959 : **19** : No. 40 : 89–118.

The roots of germinated seeds were immersed in nutrient solutions containing 200 c./l., 400 c./l. or 600 c./l. of radioactive phosphate as the only source of phosphorus and the seedlings allowed to grow. Treatment resulted in a reduction in the growth rate of the roots, intense chromosome breakage in root-tip cells during the first days of treatment, a decrease in density of chromatin and, in meiotic cells, the occurrence of bridges, lagging chromosomes and micronuclei. All the plants were partially sterile and produced smaller grains than the controls. In two plants, all the ears were branched; in their progeny, seven plants had branched ears only, 41 had normal ears only and 75 had both types. Self fertilization did not lower fertility in the treated plants.

330 WALTHER, F.
Fertilitätsuntersuchungen beim Roggen. (**Fertility investigations in rye**).
Kühn-Archiv 1958 : **72** : p. 447.

Tetraploid material descended from polyploids induced in 1938 was investigated. Compared with diploid rye, the tetraploids showed a 5% decrease in flower number per ear and a 7% decrease in fertility. Meiotic aberrations have decreased during the last six years. These aberrations lead to the formation of gametes with hypodiploid and hyperdiploid chromosome numbers and some aneuploid progeny are produced.

Increase in fertility was accompanied by decrease in 1000-grain weight.

MAIZE

331 SIDORENKO, I. D.
(**The effect of subjecting seed to ionizing radiation upon the yield of maize**).
Kukuruza (Maize) 1958 : No. 11 : 47–49. [Russian].

An account is given of experiments on increasing maize yields at Kamenec-Podol by raising plants from seed that had previously been given treatment with X rays, γ rays or ultraviolet light. Differences in yield and sensitivity to treatment between varieties and hybrids are described. Mention is made of mutants of possible breeding value. They were obtained by comparatively high doses of X rays or γ rays, 20,000 r. and 33,000 r. respectively. Among the mutants were giant forms and plants with a high tillering capacity, branched stems, branched ears or 9–12 or more ears.

332 TOMASZEWSKI, Z.
Metody hodowli kukurydzy. (**Maize-breeding methods**).
Zeszyt. nauk. wyższ. Szkoł. roln. Olsztyn. 1957 : No. 2 : 83–112.

Objectives and methods in maize breeding are reviewed for the benefit of Polish readers.

333 BRANDOLINI, A.
Prospettive del miglioramento genetico nella maiscoltura italiana. (**Prospects for genetic improvement in Italian maize cultivation**).
Agricoltura, Roma 1959 : **8** : 52–83.

An extensive review is given of maize breeding methods with special reference to achievements in Italy. The following topics are covered: the genetic basis of heterosis; selection methods, including a method of "parallel improvement" devised by the author to select four lines to constitute a double cross suited to a particular environment; general and specific combining ability; the technique of hybrid seed production; the use of cytoplasmic male-sterility and of fertility-restoring lines; breeding for resistance to *Ustilago maydis*, *Helminthosporium* spp., *Gibberella*, *Pyrausta* and *Sesamia*; the production of maize varieties with high contents of protein, oil, amylopectin or amylase; and the breeding of forage types.

334 **Review of Research of the West African Maize Research Unit for the period January 1955 - December 1957.** Pp. 50. (Mimeographed).

The major part of the work carried out at many centres in Ghana and Nigeria consisted of trials of acquisitions. Information is given on the results so far derived from Mexican, Central American, Caribbean, West African and miscellaneous collections. Breeding has been initiated with a restricted number of varieties. First-generation synthetics are to be produced, the first test for combining ability being made with S_1 lines in top crosses with the parental varieties. Inbred lines resistant to *Pyrausta* *nubilalis* were introduced from the USA as possible sources of resistance to stem borers belonging to the Agrotidae. Data from the back cross Minnesota A42.645^2 x Mexican 1 have suggested that this Minnesota inbred has recessive genes for resistance. Sources of resistance not only to *Puccinia polysora* but also to *Cochliobolus heterostophus* and *Helminthosporium turcicum* (*Trichometasphaeria turcica*) are being sought. Various aspects of the floral biology of maize were investigated under conditions at Ibadan, with a view to securing information to facilitate breeding procedures.

335 ZWIJSEN, R.
L'amélioration de la culture du maïs à Nioka. (**Improvement of the cultivation of maize at Nioka**).
Bull. agric. Congo belge 1959 : **50** : 661–74.

An account is provided of the breeding of new hybrids carried out during 1948–58 and of the performance of élite material in different localities. An early synthetic maize of high productivity and adapted to localities between 1000 and 2170 m. has been produced.

Report of Thirteenth Hybrid Corn Industry Research Conference held in Chicago, Illinois, December 3 and December 4, 1958.
Publ. Amer. Seed Tr. Assoc. 1958 : No. 13 : p. 103.

336 *Stringfield, G. H. Gene-cytoplasm interactions.* (*pp. 35–39*).

Earlier investigations by the author [XXVIII, 4188] revealed that restored ♂-sterile plants with the Texas type of sterile cytoplasm (T) and the gene *Rf* for pollen restoration had a significant advantage in grain yield over their ♂-sterile siblings (T + *rf*) in F_1 and back crosses. In a further experiment in Ohio in 1958, reciprocal crosses of three (T + *Rf*) inbreds with four (A + *rf*) inbreds were tested in the field, A designating a cytoplasm not known to be associated with ♂ sterility. No significant differential effects of the A and T cytoplasms were detected with respect to grain yield or silking date. Ear height, however, was slightly but significantly influenced by type of cytoplasm, being less in T plants. Evidence that a cytoplasmic-genotype interaction affected ear height was also obtained.

337 *Everett, H. L. Studies on corn pollen.* (*pp. 47–53*).

In connexion with breeding and genetical work, basic research on maize pollen is in progress at the Department of Plant Breeding, Cornell University. The present paper gives an account of experiments to determine: (1) the period during which maximum values for K (kernel count per ear) may be obtained, (2) the effect of temperature during storage upon pollen longevity and (3) the possibility of transporting pollen for long distances for use in hybridization. The single cross Oh.51A^{T} x Io.B8 was used exclusively as ♀ parent, pollen being applied by the brush technique. Experiments (1) and (2) were carried out by means of the K-assay method. In (1) maximum K values were obtained 6–8 days after silk emergence. In (2) storage within the range of −7° C. to 4° C. proved to be the most satisfactory, viability being retained by some pollen grains for as long as 190–200 hr. after collection. In (3) pollen in sealed ampules was subjected to low-temperature treatment and mailed in insulated boxes. The time from pollen collection to use in crossing ranged from 45 to 50 hr. Some pollen in all the samples was viable. Use of transported pollen had no adverse effect on the performance of the resulting hybrids or on pollen-restoring ability.

338 MCCAIN, F. S. & SCHULTZ, E. F. (JUN.).
A method for determining areas for corn varietal recommendations.
Agron. J. 1959 : **51** : 476–78.

"Six years of yield data from each of 15 corn variety test locations were analysed to determine if there was a logical basis for dividing Alabama into regions with respect to yield. Two regions differing only slightly from the arbitrary regions and having 5 and 4 locations produced small mean squares, indicating that these areas are relatively homogeneous. These can be designated as northern and southern Alabama. The remaining locations (central Alabama) produced a relatively large mean square indicating heterogeneity. It would be desirable to establish additional test locations in this region with the idea of delineating sub-regions of adaption." [Authors' summary].

339 CAMERON, J. W. & COLE, D. A. (JUN.).
Effects of the genes su_1, su_2, and *du* on carbohydrates in developing maize kernels.
Agron. J. 1959 : **51** : 424–27.

A detailed account is given of investigations of which a brief report has already appeared [XXIX, 955].

340 ALTENBURG, E.
Virus versus gene change in maize.
Science 1959 : **130** : p. 220.

Brink has reported that *Rrr* kernels from crosses as ♀ of plants raised from *R′rr* kernels with standard *RR* ♂ have dark-coloured aleurone like *Rrr* kernels from *rr* ♀ x standard *RR* ♂, and has concluded from this observation that a virus is not involved in the production of the weakly coloured, mottled aleurone characteristic of *R′rr* kernels from *rr* ♀ x RR^{st} ♂, since *r* gametes might also be expected to carry and transmit the virus. The present writer suggests however that the evidence from *R′rr* ♀ x *RR* ♂ does not exclude the possibility that a virus is responsible for the light aleurone of *R′rr* kernels. "Conceivably, two substances, *A* and *B*, are necessary for the continued existence of the virus. Gene R^{st} produces both and supports the virus; *R* produces *A* but not *B*; *r* produces *B* but not *A*. Moreover, we must assume that the virus rapidly disappears in a cell which lacks *A* but that it may live for a longer time in a cell which lacks *B* but has *A*, or may even linger on for several generations, largely in an inactive state, in plants which have only *A*. The virus therefore could not be transmitted by the *r* gametes of a plant that grew from an *R′rr* kernel, but it could be transmitted by the *R′* gametes. If the latter fertilized an *rr* ♀ (giving *R′rr* kernels), gene *R* would supply the *A* element and *r*, the the *B*. The virus would therefore persist, and the kernels would be light."

341 Baranov, P. A., Dubinin, N. P. & Hadjinov [Hadžinov], M. I.
Problema porumbului hibrid. (**The problem of hybrid maize**).
An. Romîno-Soviet. : Ser. Agric. 1956: No. 3 : 75–114.
[Cf. XXVI, 2293].

342 Kalinina, Z.
(Intervarietal hybrids of maize in the woody steppe zone of Siberia).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 11 : p. 52. [Russian].

An account is given of breeding work with maize at the Siberian Institute of Animal Husbandry and a table shows grain and forage yields of Perlovaja [Pearl] x Pervomajsk and three other hybrids between early and mid-season varieties which outyield the more productive parent by 30–40%. Most hybrids between varieties differing in growth period were intermediate in this respect, but some of them were earlier than the earlier parent. Most hybrids were also intermediate in such characters as plant height, number of leaves or ears and leafiness.

343 **New corn hybrid released in Virginia.**
Crops & Soils 1959 : **11** : No. 10 : 45–46.

Recently released by the Virginia Agricultural Experiment Station, VPI639 is a yellow hybrid closely related to and similar to VPI648, which it has outyielded by an average of 1·6 bushels per acre in official tests. VPI639 also has slightly better grain quality than VPI648 and seems to be less susceptible to lodging and breaking. It has fair resistance to blights and stalk rots and is recommended for counties east of the Blue Ridge.

344 Ivanova, I.
(On the varietal field stations in the Stalino province).
Kukuruza (Maize) 1958 : No. 12 : 45–46. [Russian].

The maize double cross VIR 46 [Institute of Plant Industry 46] and other Soviet hybrids were more productive and better adapted to the climatic and soil conditions than 50 hybrids introduced from other countries for testing in the above province. Three hybrids from unspecified countries are still under trial.

345 Korolenko, V. T.
(The growing of hybrids in Uzbekistan).
Kukuruza (Maize) 1958 : No. 12 : 29–30. [Russian].

Mention is made of the Soviet maize hybrids VIR 42 [Institute of Plant Industry 42] and VIR 156 which yield appreciably more grain and forage than local Uzbek varieties. VIR 42 has a short growth period and can be used as predecessor or successor to another crop. In recent Uzbek trials, some American hybrids proved highly productive. Worth mention is Pioneer 338–A, which produced 18·3 c. grain more than VIR 156 and over 40 c. more green matter.

346 Gorsline, G. W. & Korman, G. W.
Corn performance studies 1958.
Progr. Rep. Pa. agric. Exp. Sta. 1959 : No. 206 : Pp. 20.

Information is given on the performance of 219 maize hybrids in 41 tests carried out during 1958 in Pennsylvania, New York State, New Jersey and Maryland as part of the breeding programme of the Agricultural Experiment Station of Pennsylvania State University.

347 Crane, P. L., Miles, S. R. & Alvey, D. D.
Performance of commercial dent corn hybrids in Indiana, 1954–1958.
Res. Bull. Purdue Univ. 1958 : No. 671 : Pp. 20.

The yield per acre, percentage of moisture in the grains at harvest, and percentage of lodging of different hybrids tested in ten localities of Indiana are given.

348 ALFA

Dal Marano vicentino il precoce Ibrido Maliani. (From Marano vicentino, the early Maliani Hybrid).

Ital. agric. 1959 : **96** : 572–73.

A further description is given of Maliani's hybrid maize [cf. XXIX, 1475]. It matures in 110 days and can be sown immediately after a wheat crop in suitable conditions. It regularly bears 2–3 ears per plant and exceeds the parent variety Marano by over 60 c. of grain per ha. The flour produced from its grain is equal to that from Marano for making polenta and has a much higher carotene content than that from the American dent hybrids.

349 LUCENKO, A. M.

(Economic and biological properties of maize hybrids and varieties).

Kukuruza (Maize) 1958 : No. 12 : 26–27. [Russian].

Varieties and hybrids with a period from emergence to earing of 60–65 days proved the best forage types among those tested at Gor'kij, for they yielded more grain at the milky or waxy states of ripeness than forms with a longer growth period and produced more green matter than those with a shorter one. The least seasonal variability in the period emergence to earing was observed in the hybrids VIR 25 [Institute of Plant Industry 25], Uspeh [Success] and Dnepr 2.

350 BUNTING, E. S. & WILLEY, L. A.

The cultivation of maize for fodder and ensilage. Part II. The effect of changes in plant density.

J. agric. Sci. 1959 : **52** : 313–19.

The effects of sowing rate on earliness, height, yield, ear development, lodging, chemical composition of the dry matter and yield of nutrients in hybrids and open-pollinated varieties are described. The results from these variety x plant density experiments, together with data on varieties previously reported [XXIX, 2570], suggest that the early hybrid Wisconsin 275, the medium-early hybrids Wisconsin 335, 355, 416 and 464 and the medium-late hybrid Wisconsin 341A, grown at a density of 9–12 plants per sq. yard, would be most suitable for fodder and ensilage in Britain.

351 SPRAGUE, G. F., RUSSELL, W. A. & PENNY, L. H.

Further studies on convergent improvement in corn.

Genetics 1959 : **44** : 341–46.

The F_1 hybrid of the two lines B2 and K4 was back crossed reciprocally to the parental inbreds for three successive generations. Certain sublines were then self pollinated for three generations to fix desirable genes retained by selection from the back-cross generations; the recovered lines were evaluated in single-cross combinations, the best being designated B2a and K4a. These two lines were used as parental material in a similar second cycle of convergent improvement involving back crossing for three generations and then selfing selected sublines for two generations before combining them in single crosses. The crosses and inbred parents were tested in replicated yield trials. First-cycle lines were higher in yield than the original lines; the increase for B2a was 22·4% and for K4a, 6·3%. The yields of second-cycle B2b lines ranged from less than that of the original line to 21% above that of B2a. All the second-cycle K4b lines were equal or superior to K4 in yield. The single crosses amongst the best of the recovered lines were slightly lower in yield than the original or first-cycle hybrids. Most crosses involving the higher-yielding lines were not significantly lower in yield than the parent hybrids. These results are thought to support the hypothesis that yield heterosis depends on dominance. Additional evidence in support of this view was the significant correlation between yields of the recovered lines and the average of that of their test-cross progeny; also parent-offspring regression for the constant parent groups indicated either dominance of low yield or partial dominance of high yield rather than overdominance.

352 HOEN, K. & ANDREW, R. H.

Performance of corn hybrids with various ratios of flint-dent germ plasm.

Agron. J. 1959 : **51** : 451–54.

An open-pollinated flint variety, Janetzki's Gloria, two S_2 inbreds from this variety, an S_2 inbred from the flint-dent variety Falconer, a synthetic developed from Brown County Yellow Dent and three S_2 inbreds from this synthetic were combined in top crosses and in single, double and three-way crosses and these crosses were grown at Madison and Spooner, Wis. In general the top crosses involving the dent

synthetic outyielded those from the open-pollinated flint variety but the order of the inbreds with respect to their top-cross yields was the same for both testers in any one trial. Inbreds differed considerably in combining ability; top crosses and single crosses gave essentially the same evaluation of the inbreds. The best experimental hybrids gave higher yields but were later in silking and higher in moisture content at harvest than standard hybrids. Yield was positively correlated with ear number, number of kernel rows, kernels per row, 1000-kernel weight and dent appearance (large ear height and low tiller number).
Three methods of predicting double-hybrid performance were used; the average yield of the four single crosses and their reciprocals was found to give a good estimate of the yield of the double cross. Correlations between observed and predicted yields varied with the locality. [Cf. XXVIII, 1321].

353 Rumbaugh, M. D. & Lonnquist, J. H.
Inbreeding depression of diallel crosses of selected lines of corn.
Agron. J. 1959 : **51** : 407–12.

Thirty-six S_1 lines of Krug were evaluated for general combining ability for yield by means of top crosses with the parental variety. Four lines with top-cross yields 1 or more standard-deviation units above the mean of all top crosses and another four with top-cross yields 1 or more units below this mean were chosen for further study. Selection for the divergent yielding ability in test crosses with the single cross Wf9 x M14 was practised after each generation of selfing for five generations, prior to making all possible crosses among the eight lines so as to produce three groups of hybrids, viz. H x H, H x L and L x L, H and L signifying high and low combining ability respectively. The hybrids were selfed until F_5 seed had been obtained. The parental S_5 lines and their respective diallel crosses (F_1–F_5) were then grown in a randomized incomplete block experiment. Data on plant and ear height and grain yield were analysed by the following three methods: regression of the means on levels of heterozygosity, (2) constant parent-progeny regressions and (3) the graphic method of diallel analysis described by Allard [XXVII, 3577]. The three methods of analysis did not give consistent results concerning dominance. Although the data were preponderantly in favour of partial dominance, some indications of overdominance were obtained. It is concluded that the additive model of gene action with partial dominance prevailed in the population analysed and the breeding schemes applied to the material in question should be based on this assumption.

354 Sprague, G. F., Russell, W. A. & Penny, L. H.
Recurrent selection for specific combining ability and type of gene action involved in yield heterosis in corn.
Agron. J. 1959 : **51** : 392–94.

The open-pollinated varieties Lancaster Surecrop and Kolkmeier (an Indiana strain of Reid) were used as parental material (C_0). The tester for the first cycle was the single cross WF9 x Hy and for later cycles the inbred Hy. In the first cycle, selected plants of the two varieties were selfed and at the same time crossed on to WF9 x Hy. Diallel crosses involving the S_1 lines of the five plants which had given the best test-cross performance were made within each variety. These intercross populations were increased by sibbing and designated Lancaster C_1 and Kolkmeier C_1. The same intercross material was also planted on an intercross progeny basis and resampled. Selected plants in each intercross progeny were selfed and outcrossed to Hy. Remnant S_1 seed of the 10 test crosses giving the highest yield in each series was sown and intravarietal diallel crosses produced. Equal numbers of seeds from each single cross were composited and the increases secured by sibbing were designated Lancaster C_2 and Kolkmeier C_2. Selfing and test crossing of individual plants within each series have continued. Compared with Lancaster C_0 x Hy, Lancaster C_1 x Hy and Lancaster C_2 x Hy gave yield increases of 3·9 and 6·5 bushels per acre, respectively. The corresponding increases for the Kolkmeier series were 7·0 and 20·0. Estimates of the variance component of the test-cross progenies for yield were not critical but indicated a reduction in genetic variability. Some additive genetic variance persisted after the two cycles of selection. Compared with the C_0, yields of the C_1 composites were reduced in both the Lancaster and Kolkmeier series. The yields of the C_2 composites were essentially the same as those of the C_0 populations. The series of intervarietal hybrids C_0 x C_0, C_1 x C_1 and C_2 x C_2 showed a trend of increasing yield. It is concluded that for the material investigated partial and complete dominance provided the most satisfactory explanation of the gene action responsible for heterosis for yield.

355 Pavlovskij, S. F.
(Improving the varietal uniformity of self-pollinated lines).
Kukuruza (Maize) 1958 : No. 11 : 44–46. [Russian].

Eighteen maize inbreds sent for tests to the USSR Maize Institute by many Soviet breeding stations have been found less pure than permissible. The admixtures included hybrids with much heavier ears and with rachids of the wrong colour. Measures recommended by the Maize Institute to improve the production of pure maize seed are outlined.

356 Haskell, G.
Further evidence against pleiotropic gene action in correlated responses to selection.
Genetica 1959 : **30** : 140–51.

Selection for earliness in American inbred and hybrid sweet-corn is shown to have been accompanied by a decrease in plant height and in number of leaves, while other quantitative characters studied showed no change. Progenies from maize seedlings surviving cold selection showed no correlated responses, but seeds of the earliest and hardiest line were duller and less wrinkled. Seeds from maize selections for low oil or low protein were heavier than those for high and remained viable for a shorter time. Since in the first example both plant height and leaf number regress on earliness, while the ratio of plant height to leaf number, *i.e.* mean internode length, does not, it is suggested that in this case the genes for earliness have no pleiotropic effect.

357 Gotoh, K.
Intra-inbred line variation in number of tassel branches of corn.
Japan. J. Bot. 1959 : **17** : 1–13.

Variation in the number of tassel branches was investigated in lines which had been inbred for a long time (LIL) and in double haploid lines (DHL). In both cases the phenotypic variation was unexpectedly great. In 1956 the coefficient of variability (*c.v.*) varied from 9 to 31% in LIL and from 6 to 20% in DHL, whilst in 1957, *c.v.* varied between 13 and 48% in LIL and between 15 and 34% in DHL. The *c.v.* of 15 inbred lines in both years showed high correlation ($r = 0{\cdot}7097$) and it is concluded that phenotypic variation is an inherent characteristic of inbred lines. The coefficient of variation of some F_1 hybrids was found to be smaller than that of the parental varieties and some of the F_1s showed considerable heterosis in the number of tassel branches. The average heritability in the broad sense was 58·6% for five crosses.

Disregarding genetic sources of variation, the variance of the LIL and DHL is thought to have the following components: (1) a part due to experimental error; (2) a part due to environmental variation itself and (3) a part due to "self-regulating ability", this being the resistance of plants to environmental fluctuations. It is assumed that lines differ in their self-regulating ability.

358 Smith, J. H. C., Durham, J. L. & Wurster, C. F.
Formation and bleaching of chlorophyll in albino corn seedlings.
Plant Physiol. 1959 : **34** : 340–45.

All the albino mutants examined formed protochlorophyll and protochlorophyllide during germination and growth in the dark, converted these pigments into chlorophyll and chlorophyllide upon exposure to light and showed bleaching as the result of continued illumination. It is concluded that none of the following factors is solely responsible for the stability or instability of the chlorophyll: capacity for esterification, postillumination change in the chlorophyll absorption maximum and amount of carotenoid.

359 Schwartz, D.
A new mutable gene in maize.
Proc. 10th. int. Congr. Genet. 1958 : **2** : p. 256.

"A spontaneously occurring mutational system at the *c* locus in maize is under investigation. This highly mutable recessive allele, c^m, mutates to both a stable *C* and to a stable *c*. Mutations can occur in the sporophyte and gametophyte, as well as in the endosperm. The mutability of c^m is autonomously controlled and is not associated with any detectable chromosome breakage. It is completely independent of the *Ac–Ds* system.

"The c^m gene is stable in the zygote and does not mutate. This stable condition is maintained until some time during ontogeny when the gene becomes unstable and free to mutate. The time at which the shift to instability occurs is determined by the state of c^m. Three distinct states can be recognized. In the late state, the stability is maintained until after fertilization and mutations occur only in the endosperm. In the intermediate state, the shift occurs sometime around meiosis so that some mutations occur before fertilization giving rise to self-colored kernels. In the early state, the c^m gene becomes unstable in the young sporophyte giving rise to large mutant sectors on the ears. At fertilization, those genes in the zygotes that have not as yet mutated revert to the stable condition and the cycle is repeated." [Author's summary].

360 Stein, O. L. & Steffensen, D.
Radiation-induced genetic markers in the study of leaf growth in *Zea*.
Amer. J. Bot. 1959 : **46** : 485–89.

The results of a study of leaf growth in maize in which use was made of a radiation-induced histogenetic marker are reported. Soaked seeds with embryos heterozygous for the mutant character of yellow-green plant colour (yg_2, chromosome 9) were exposed to a moderate dose of X rays. The sectors occurring as the result of loss of the dominant gene Yg_2 provided a means of following the ontogeny of leaves formed in the embryo at the time of irradiation.

361 Ljubimov, I. M.
(Maize in the Gornyj Altaj).
Kukuruza (Maize) 1958 : No. 10 : p. 13. [Russian].

Mention is made of the maize variety Gorno-Altajsk 1 which ripens grain in the foothills of the above region. It was bred in the Gorno-Altajsk Agricultural Research Station.

362 Muminov, H.
(A new high-yielding variety).
Kukuruza (Maize) 1958 : No. 10 : p. 28. [Russian].

Mention is made of Massino, a new maize variety of unspecified origin, which yielded the most forage and grain in trials in Kara Kalpakia.

363 **Nebraska 603 is new mid-season corn.**
Crops & Soils 1959 : **11** : No. 10 : p. 27.

This midseason variety gives high yields averaging 132 bushels per acre; it is adapted to east central Nebraska and the Platte Valley. The short thick ears are suitable for mechanical picking and the stalk is strong and of medium height.

The origin of corn.
Bot. Mus. Leafl. Harv. 1959 : **18** : 329–440.

364 *Mangelsdorf, P. C. & Reeves, R. G. The origin of corn. I. Pod corn, the ancestral form. (pp. 329–56).*

The evidence for and against the hypothesis that cultivated maize originated from a wild form of pod corn once indigenous to the lowlands of South America is reviewed and attempts are made to answer Weatherwax's objections to the hypothesis. Weatherwax has said that pod corn is "equivocal", meaning presumably that it is extremely variable; this however is only true when the genetic background is variable and in inbred strains and uniform F_1 hybrids the pod character is no more variable than other characteristics of maize. Another objection is that modern pod corn is often monstrous and sterile. But this is because modern pod corn is the product of a wild relict character superimposed upon modern, highly heterozygous and vigorous varieties, some of which are the result of teosinte introgression; pod corn is neither monstrous nor sterile in combination with other primitive characters. The hypothesis is further supported by the fact that pod corn differs from other monstrous forms such as teopod and corn grass in consistently having the essentially wild characteristic of glume-enclosed seeds. Also when the pod-corn gene is combined with the genes of certain popcorn varieties, the resulting plants have many of the characteristics of a wild grass, e.g. a freely branching growth habit. The suggestion that the characteristics of pod corn are the product of plant hormone action is considered to be quite valid but irrelevant to the argument. The half tunicate form of pod corn is in some respects more likely as the ancestral type than the fully tunicate form but this possibility has been rejected by Weatherwax, who concluded that the half tunicate character involves only the glumes. This conclusion is now shown to be erroneous; it resulted from confusing half tunicate with the papyrescent ear character.

Various alleles have been found at the *Tu* locus of pod corn; these include tu^h responsible for an intermediate form. The six genotypes *Tu Tu*, $Tutu^h$, *Tutu* tu^htu^h, tu^htu and *tu tu* were investigated in plants isogenic for other loci. Various structural changes were noted proceeding through the series from *Tu Tu* to *tu tu*. For example there was a decline in the prominence of the tassel and a corresponding increase in the development of the ear. The changes observed were of a kind that might have occurred in evolution under domestication. Such profound changes in the direction from a wild plant to a useful one have not been demonstrated in teopod or corn grass. By combining alleles of the *Tu* locus with various modifying and inhibiting factors it was possible to produce types with cobs similar to prehistoric types thought to be forms of pod corn. The tu^h allele is quite frequent in living varieties; this would be unlikely if the original maize had the *tu tu* genotype. Strong support for the pod-corn hypothesis is also provided by a reconstruction of the ancestral form obtained by combining pod corn characteristics with those of popcorn varieties. This reconstruction is almost identical with the hypothetical ancestor based on comparative morphology and suggested by Weatherwax.

365 *Reeves, R. G. & Mangelsdorf, P. C. The origin of corn. II. Teosinte, a hybrid of corn and* Tripsacum. *(pp. 357–87).*

Since it was first suggested in 1939 that teosinte originated as a hybrid between maize and *Tripsacum*, more circumstantial evidence in support of this hypothesis has accumulated. The cross between maize and *Tripsacum* has been successfully repeated without the use of special techniques. *T. dactyloides* seems to be the most likely species involved in the original cross. It has been found in Guatemala where teosinte is believed to have originated and where maize has been abundant since ancient times. There is some evidence that *T. dactyloides* or similar forms were previously more abundant in this area. Critics of the above hypothesis have said that *Tripsacum* chromosomes and genes have a negligible effect when in combination with maize cytoplasm but it has now been shown *Tripsacum* genes do have some phenotypic effect in maize-*Tripsacum* hybrids. Also crossing over is known to occur between maize and *Tripsacum* chromosomes. Annual teosinte, which is the species most comparable to modern maize, is intermediate between maize and *Tripsacum* in the number and position of the chromosome knobs. A correlation exists in maize varieties between frequency of chromosome knobs and proximity of their native locality to Guatemala and Mexico. This correlation may be explained by assuming that pure maize without knobs was already widespread over the American continent when teosinte arose. Maize and teosinte began to hybridize and maize with knob-bearing chromosomes then started to diffuse from Guatemala and southern Mexico and this is still going on. One objection to the hypothesis that chromosome knobs have been transferred from *Tripsacum* through teosinte to maize is that since knobs are mostly terminal in *Tripsacum* and intercalary in maize, a transfer would require chromosomal rearrangements for which there is little evidence. However, structural rearrangements of chromosomes have now been demonstrated in maize, and some forms of *Tripsacum* have been shown to have a few internal knobs. Also teosinte has very few plant characters of its own and is either intermediate between maize and *Tripsacum* or similar to one or the other in almost all characters. There is evidence from fossil and archeological remains that teosinte arose after maize and *Tripsacum* were well established. Maize and teosinte are thought to be congeneric species.

366 *Mangelsdorf, P. C. & Reeves, R. G. The origin of corn. III. Modern races, the product of teosinte introgression. (pp. 389–411).*

Randolph's objections to the above hypothesis are discussed. The suggestion that there is little natural crossing between maize and teosinte has been found to be contrary to the facts for hybridization is quite common in parts of Mexico and Guatemala and is thought to have been going on for centuries. It has also been said that the extent to which hybridization between the two species has resulted in gene exchange is open to question. However, maize characters have now been found in teosinte and it is difficult to see how gene exchange could be prevented. There is abundant cytological evidence for teosinte introgression if it is assumed that the knobs of maize come from teosinte and are also good indicators of introgression. Randolph has said that there is no evidence that introgression, if it occurs, leads to maize improvement but now there is both circumstantial and direct evidence of such improvement; for example teosinte introgression into some Texas inbreds resulted in greater tolerance of heat in one case and in improved yield in another. In answer to the suggestion that characters found in maize and attributed to teosinte introgression can equally well be explained as the result of parallel mutation, it is pointed out that there is no evidence of such mutation and the fact that several such characters may appear simultaneously indicates genetic recombination following hybridization. Some prehistoric maize cobs closely resemble those of segregates of maize-teosinte hybrids and there is also archeological evidence that teosinte introgression in the past was accompanied by increased variability and some improvement. Hybridization of maize and teosinte not only yields favourable genetic combinations but recently mutagenic effects have also been described. Some of the beneficial effects may have played an important role in the evolution of cultivated maize.

There is also some evidence of direct introgression of *Tripsacum* into maize, and chromosomes with tripsacoid effects have been extracted from maize varieties.

367 *Mangelsdorf, P. C. & Reeves, R. G.*
The origin of corn. IV. Place and time of origin. (pp. 413–27).

The idea of a single origin of maize in the lowlands of S. America has been abandoned and it is now thought that there was at least one centre of origin in Central America. The possibility of another independent centre of origin in South America is not ruled out. It is thought that maize was first domesticated about 5000 years ago.

368 *Reeves, R. G. & Mangelsdorf, P. C.*
The origin of corn. V. A critique of current theories. (pp. 428–40).

It has been suggested by Andres that papyrescent (semivestido) maize is a possible ancestor of maize. This type superficially resembles a weak form of pod corn. However it has defective development and is therefore considered unlikely as the primitive form of modern maize. No archeological specimens of papyrescent maize have yet been found. The possibility of corn grass being the ancestor of maize is also thought to be remote. Corn grass has only some of the characters expected in an ancestral form and has others which are not demanded of a hypothetical ancestor. There is no archeological evidence supporting the corn-grass hypothesis. The suggestions that maize originated as a domesticated form of teosinte or the product of a cross between teosinte and an unknown grass are supported by the discovery that teosinte grains will pop on heating, so shattering the hard outer covering; this indicates how teosinte might have been used as food and hence it may have undergone domestication but there is no evidence to show that teosinte was ever used in this manner. Emerson has contended that a few large-scale mutations could transform teosinte into maize and some characters distinguishing the species are inherited in a simple Mendelian manner; however the distinguishing characters are numerous and distributed amongst most of the chromosomes. Studies of fossil pollen and archeological findings do not support the teosinte hypothesis. The earliest maize was less like teosinte than some recent maize is.

Weatherwax has suggested that maize, *Tripsacum* and teosinte have a common ancestry. It is said that there is little factual evidence for this hypothesis which depends largely on the assumed correlation between common ancestry and common place of origin. Also the hypothesis does not explain certain facts such as teosinte being intermediate between maize and *Tripsacum* in many characters and fossil pollen of maize and *Tripsacum* being found at greater depths than that of teosinte. Certain resemblances between the hypothesis of the authors and that of Weatherwax are noted.

369 FABERGÉ, A. C.
Production by alpha particles of functionally stable broken chromosome ends in maize.
Genetics 1959 : **44** : 279–85.

Pollen carrying the linked dominant markers *I*, *Sh*, *Bz* and *Wx* (chromosome 9) was irradiated with particles from an external plutonium source and used to pollinate plants carrying the corresponding recessives. From an analysis of the resulting marker losses and endosperm mosaics, it was calculated that the ratio of stable broken ends to unstable broken ends was about 0·54±0·20 or that about 35% of all terminal breaks were truly stable and did not generate breakage-fusion-bridge cycles in later cell divisions. Comparable data from X-ray and ultraviolet treatments [cf. XXVI, 3282] indicated that these mutagens induced few if any stable broken ends.

370 MAZOTI, L. B. & MUHLENBERG, C. E.
Haploides naturales en maíz. (**Natural haploids in maize**).
Rev. argent. Agron. 1958 : **25** : 171–78.

Crosses were effected between a diploid homozygous pollen parent C with the constitution *ABCRPlGl.Ij* and three diploid homozygous female parents, viz. A, with *abCrplgl.ij*, B with the same genotype in teosinte cytoplasm obtained by repeated back crossing, and D, with a_2v_2bt. Since the male parent was homozygous and dominant for purple coloration, green F_1 plants were supposed to be haploid and this was confirmed by root-tip chromosome counts or by the high degree of pollen sterility. The gene *ij* (variegated) was not expressed in teosinte cytoplasm in either the single or the double dose, but was expressed in both doses in maize cytoplasm. In the cross D x C, a single dose of *bt* did not produce a lethal effect. The frequency of haploid production differed significantly in the two experimental years, and in one year significantly more haploids were produced in teosinte than in maize cytoplasm.

371 SIDOROV, F. F. & GERCUSKIJ, D. F.
(**Early varieties, initial material for breeding**).
Kukuruza (Maize) 1958 : **10** : 25–28. [Russian].

The breeding of early maize varieties is discussed in relation to the characteristics of initial material from the Institute of Plant Industry. Particulars as to the origin and morphological properties of 19 forms, which are thought to possess the most breeding value, are given in tabular form. Variability in grain size and combining ability is referred to briefly. Breeding at the Ustimovskaja Branch Station of the Institute is mentioned. The results include a hybrid between a very early and an early variety; it has an intermediate growth period and yields as much grain as the more productive parent. Also mentioned are various top crosses bred at the same station. All outyield the higher-yielding parent and have growth periods not exceeding 97 days.

372 BRANDOLINI, A.
Il contributo della ricerca alla metodologia della produzione commerciale delle sementi ibride di mais. **(The contribution of research to the methods of commercial seed production of hybrid maize).**
Maydica, Bergamo 1959 : **4** : 82–91.

Reference is made to the work of Hutchcroft on the effects of imperfect emasculation [cf. XXIX, 3831] and to various publications on the use of male-sterile lines and the methods of preventing outpollination. Observations at the Maize Research Institute at Bergamo have shown that plants that escaped pollination can still be fertilized by a variety that comes into flower 20–30 days later.

373 SASS, J. E. & LOEFFEL, F. A.
Development of axillary buds in maize in relation to barrenness.
Agron. J. 1959 : **51** : 484–86.

The single crosses and inbred lines studied showed a marked increase in barren plants at high population levels; barrenness was the result of the silks failing to emerge. The single crosses and inbreds differed in their response to population levels.

374 MÜLLER, H. W. & SCHILOWA, I.
Beiträge zur Maiszüchtung. II. Befruchtungsergebnisse nach künstlicher Bestäubung in Abhängigkeit vom Narbenalter und der Pollenlagerung bei verschiedener Temperatur und Luftfeuchtigkeit. **(Contributions to maize breeding. II. Fertilization results after artificial pollination depending on stigma age and pollen storage at different temperatures and air humidity).**
Züchter 1959 : **29** : 187–91.

The female inflorescence remains functional for a longer period of time in central Germany than in the major maize-growing areas of the world. This facilitates crossing between varieties of different maturity groups. The best results follow fertilization between the seventh and ninth days after emergence of the styles. Pollen remains viable for about 48 hr. in a damp atmosphere under normal conditions of temperature; it may be kept for a longer period at about 2° C. but after 120 hr. is no longer viable. A combination of low temperature and fairly dry atmosphere provides the best conditions for storing pollen.

375 TIHONOV, N. I.
(The protein content of the grain).
Kukuruza (Maize) 1958 : No. **10** : 45–46. [Russian].

Voronež 76, Romny, Odessa 10, Bukovina 1 and Dneprovsk 16 had the highest protein contents among maize varieties and hybrids tested in the Sumy province.

376 VECSEY, T. & VÉGH, J. (MRS.).
Silózás céljára termesztett kukoricafajták összehasonlító vizsgálata. **(Comparative tests of maize varieties grown for silage).**
Debrecen. mezőgazd. Akad. Tudomány. Évk. 1957 (1958) : 275–90.

The results of Hungarian tests of nine varieties in 1956 and six different varieties in 1957 are presented, data being given on yields of green matter, dry matter, ears, leaves, stems, starch and digestible protein. In the first trial Óvári 4 gave the highest starch yield, while the hybrid Mv.5 was best in the second.

377 KAPÁS, S.
Silózásra termesztett kukoricafajták 1956. és 57. évi kísérleti eredményei. **(The results of trials of maize varieties grown for silage, 1956 and 1957).**
Növénytermelés 1959 : **8** : 15–23.

Data on the yields, flowering time, tillering, dry matter, ash, crude protein, crude fat, crude fibre, nitrogen-free extract, digestible protein, starch and percentage yields of stem, leaves and ears are given for seven varieties tested in eight localities in Hungary. The intervarietal hybrid Ó.4 and Szegedi Sárga [Szeged Yellow] gave the highest yields while M siló, which had the greatest number of tillers, gave the lowest.

378 NELSON, R. R.
Genetics of *Cochliobolus heterostrophus*. I. Variability in degree of compatibility.
Mycologia 1959 : **51** : 18–23.

Monoconidial and monascosporic isolates of *C.*

heterostrophus varied in their degree of compatibility and these differences appeared to be gene controlled. It is probable that the genes controlling intergroup fertility influence the major gene locus for compatibility.

379 NELSON, R. R.
Genetics of *Cochliobolus heterostrophus*. II. Genetic factors inhibiting ascospore formation.
Mycologia 1959 : **51** : 24–30.

Perithecia containing sterile asci were obtained on selfing a monascosporic isolate obtained from a cross of two heterothallic conidial isolates. The self-sterile isolate was found to comprise two kinds of homocaryotic hyphae, one belonging to the *A* compatibility group and the other to ***a***. Crosses of both components with heterothallic isolates produced perithecia with both sterile and fertile asci and back crosses to each component gave perithecia with no asci, perithecia with only sterile asci and perithecia with sterile and normal asci in varying proportions.

The original self-sterile isolate may have originated from an ascospore with two nuclei. Mutation before or after spore formation or genetic recombination may have brought about a combination of genes inhibiting ascospore formation. Also it is suggested that the distinction between homothallism and heterothallism may depend "more on segregation of genes that block steps in the sexual process than on the incorporation of positive genes for reproduction".

380 **Rust-resistant corn is closer.**
Crops & Soils 1959 : **11** : No. 10 : p. 26.

The US Department of Agriculture and the Wisconsin, Illinois and Iowa Agricultural Experiment Stations have been engaged in a joint effort to produce rust-resistant maize hybrids. Parent stock is now available, each parent strain containing one to eight gene pairs for rust resistance. Attempts are at present being made to stabilize other desirable characteristics in the resistant inbreds; two of these are ready for use in incorporating resistance into present commercial hybrids.

381 KOEHLER, B.
Corn ear rots in Illinois.
Bull. Ill. agric. Exp. Sta. 1959 : No. 639 : Pp. 87.

No inbreds or hybrids are immune or even highly resistant to the various ear rot diseases described. Inbreds Ill.90, Ill.R4, C1540, Ia.701, Ia.B10 and Ill.R59 appear to be among the best for transmitting combined resistance to ear rots caused by *Diplodia zeae* and *Fusarium moniliforme* (*Gibberella fujikuroi*). However, they are not of any commercial value owing to their low yields, slow drying and susceptibility to stalk rot. Inherited resistance to any one rot is largely independent of inherited resistance to other rots. Resistance to *D. zeae* and other common ear rots is multigenic.

382 KOPPÁNYI, T. & KOVÁCS, B.
Molyfertőzés néhány fontosabb kukoricafajta különböző vetésidejű állományaiban. (**Borer attack on some important maize varieties at different sowing times**).
Debrecen. mezőgazd. Akad. Tudomány. Évk. 1957 (1958) : 297–308.

Varietal differences in attack by *Pyrausta nubilalis* were noted, but those due to sowing time were greater.

BARLEY

383 Société d'encouragement de la culture des orges de brasserie et des houblons en France. Rapports sur la campagne 1957. (**Society for the promotion of the cultivation of malting barleys and hops in France. Reports for the year 1957**). Pp. 75.

A detailed report is presented on the general performance of varieties and hybrids of barley tested at various centres in France.

384 WILTEN, W. & COENRADIE, J.
De veldproeven in 1958. (**The field trials in 1958**).
23e Nacobrouw Jb. 1959 : 56–72.

Results of yield trials and tests of malting quality are reported for varieties of spring barley in the Netherlands. The two new MGH lines 55026 and 55045 gave particularly good yields and were intermediate between Balder and Union in earliness. It is noted that Balder and Proctor show resistance to variation in climate, giving consistently good yields in different years.

385 Wintergerst, 1959. (**Winter barley, 1959**).
Landbouwvoorlichting **16** : Bijl. 52; Ber. Rassenkeuze 1959 : No. 269 : Pp. 2.

Data on yields of grain and straw and notes on performance are given for 11 varieties tested on different soil types in the Netherlands. The new variety MG203 gave good yields on all soils and is to be entered in the official varietal list.

386 **Progress report of the Midwest Barley Improvement Association given at the Annual Meeting held at Milwaukee, Wisconsin 1958.** Pp. 32. (Mimeographed).

This report of the various activities sponsored by the Malting Barley Improvement Association, USA, includes brief information on (1) varieties recommended for sowing in 1959, (2) American and foreign varieties under commercial trial, (3) testing of selections for quality under experimental and industrial conditions and (4) breeding. Varieties under trial comprise Forrest [XXVII, 4028], Parkland [XXVII, 1798], Liberty [XXVII, 4028], Betzes and Haisa II. With a view to facilitating the study of the inheritance of properties involved in malting quality, the value of a micromalting technique requiring less than 15 g. of barley is being determined. Preliminary information was gained on the microorganisms associated with discoloured kernels. Selections are being tested for susceptibility to kernel discoloration with a view to establishing procedures for screening for resistance. Some progress has been made in an attempt to incorporate the resistance to spot blotch (*Cochliobolus sativus*) of wild barley species in cultivated varieties. The possibility of developing hardy winter barleys with acceptable malting and brewing qualities is being explored.

387 Tsuchiya, T.
Genetic studies in trisomic barley. I. Relationships between trisomics and genetic linkage groups of barley.
Japan. J. Bot. 1959 : **17** : 14–28.

The characteristics of seven trisomic types obtained from autotriploid plants of *Hordeum spontaneum* var. *transcaspicum* are described. All of these trisomics are highly fertile when selfed or crossed with normal diploids. Tests were made using the trisomics on the inheritance of nine marker genes in the seven linkage groups; *H. spontaneum* var. *transcaspicum* is homozygous for the eight dominant and one recessive characters allelic to the nine markers in the linkage testers. The extra chromosomes in the trisomics Slender, Pseudonormal, Semierect and Pale were found to carry the linkage groups I, II, V and VI respectively. The extra chromosome of Bush carried the two linkage groups III and VII. In Purple, the extra chromosome was shown to carry no known linkage group. Linkage group IV has still not been associated with any of the trisomic types. However the independence of group IV seems to be well established. In an addendum to this paper, reference is made to recent findings published elsewhere and indicating the existence of seven linkage groups in barley.

388 Andersen, W. R.
Linkage relationships of located and unlocated genetic testers in certain normal and translocation stocks of barley.
Abstr. Thes. Utah St. Univ. 1958 : **6** : No. 3 : 14–15.

The factor pairs *Ghgh*, *Gsgs*, *Trtr* and *Trdtrd* showed monohybrid segregation. In three crosses, purple *v.* nonpurple lemma and pericarp (Re_2re_2) segregated in a 9 : 7 ratio. The following gene pairs were linked with semisterility: (1) *Kk* (hooded *v.* awned condition), *Gsgs* (normal *v.* glossy stem and ear), (2) *Nn* (covered *v.* naked caryopsis) and (3) *Zz* (normal *v.* zoned leaf) and *Ghgh* (long *v.* short rachilla hairs), (1), (2) and (3) being respectively indicated by data from translocations (c + e), (b + d) and (a + e). Linkage was also detected between *Vv* and *Ee*, *Vv* and Re_2re_2, and *Ghgh* and *Kk*. Translocations (c + e) and (a + e) are linked with gene pairs previously established in linkage group IV; it may be assumed that they involve a portion of chromosome IV which includes *Ghgh*, *Kk* and possibly *Gsgs*.

389 Heiner, R. E.
Linkage and inheritance studies in barley (*Hordeum*).
Abstr. Thes. Utah St. Univ. 1958 : **6** : No. 3 : 18–19.

Data from 24 crosses indicated that the characters *Tr*, *Vt*, *Li*, Re_2, *L*, *E*, *D*, *B*, *Trd*, *N*, *Br*, *K*, *Bl*, *Z*, *S*, *Gh*, *Gs*, *Rb* and *O* segregated according to a monohybrid ratio, with the exception of the dihybrid ratio for *K* in three crosses and for Re_2 in one cross. The character *Pr* had a dihybrid ratio. Linkage was detected between the following gene pairs: group I, *Vv* and Re_2re_2, *Vv* and *Ll*, *Vv* and *Prpr*, *Vv* and *Ee*, Re_2re_2 and *Ee*, *Prpr* and *Ee*, *Ee* and *Ll*, *Dd* and *Ll*, Re_2re_2 and *Prpr*, Re_2re_2 and *Ll*; group II, *Bb* and *Trdtrd*; group IV, *Kk* and *Zz*, *Kk* and *Glgl*, *Blbl* and *Glgl*; and group V, *Rr* and *Ss*. In addition, *Ghgh* and Kk_1 may be linked.

390 Bandlow, G.
Mutationsversuche an Kulturpflanzen. X. Über Pleiotropie und eine zweifache Mutante bei Wintergerste. (**Mutation experiments on cultivated plants. X. Pleiotropy and a double mutant in winter barley**).
Züchter 1959 : **29** : 123–32.

Crosses were made between mutants deviating from the normal in several characters and assumed to be pleiotropic and other mutants in order to see whether any characters could be eliminated from the pleiotropic complex. This did not occur with three mutants studied. The character complexes of the mutants *curta* (short beard, partially sterile), *fragilis* (weak habit, brittle awns) and *divaricata* (short stem, spreading awns) remained pleiotropically coupled in all crosses. *Eburata* (white ears, late ripening and 10% sterile) was crossed with *matura* (early, 4% sterile) and the results showed that *eburata* is a double mutant with a recessive allele for white ear and a dominant allele for late ripening. The sterility appeared to be under the control of both internal and external factors; it was greater in dihybrid heterozygotes than in monohybrids.

391 GUBERNATOR, V. S.
(Sowing in late autumn as a method of directed changing of the heritable basis of spring barley).
Agrobiologija (Agrobiology) 1958 : No. 6 : 61–67. [Russian].

The heritable basis of spring barleys was shattered by sowing them for one growth period as a winter crop at Nosovka, Černigov province. By combining shattering with group selection or single plant selection, Černigov, Černigov 5 and Nosovka 2 were obtained from unspecified material. All three outyield the standard varieties such as Hanna Loosdorf, and Černigov and Černigov 5 are also superior in brewing quality. All the new varieties have large grain and are resistant to lodging, pests and diseases, in particular to *Helminthosporium* and *Ustilago*.

392 WILTEN, W.
Opbrengsten, rassenstatistiek en raseigenschappen van zomergerst. **(Yields, varietal statistics and varietal characteristics of spring barley).**
23e Nacobrouw Jb. 1959 : 73–83.

Tabulated data and comments are presented on the yields, acreage and chief characteristics of varieties grown in the Netherlands.

393 MORRISON, J. W.
Cytogenetic studies in the genus *Hordeum*. I. Chromosome morphology.
Canad. J. Bot. 1959 : **37** : 527–38.

On the basis of similarities in caryotype and morphological characters of the plants the species studied were placed in seven groups designated (1) *vulgare*, (2) *marinum*, (3) *murinum*, (4) *californicum*, (5) *stenostachys-pusillum*, (6) *bulbosum* and (7) *jubatum*. The composition of the groups is as follows: (1) *H. vulgare*, *H. spontaneum*, *H. agriocrithon*; (2) *H. marinum* (2*x*, 4*x*), *H. maritimum* (2*x*), *H. hystrix* (2*x*), *H. gussoneanum* (4*x*), *H. leporinum* (2*x*), *H. glaucum* (*H. stebbinsii*) (2*x*, 4*x*); (4) *H. californicum* (2*x*); (5) 2*x* collections received as *H. stenostachys* and *H. pusillum*; (6) *H. bulbosum* (2*x*, 4*x*); *H. ithaburense* (2*x*); and (7) *H. jubatum* (4*x*). In the *vulgare* group, the caryotype consisted of two pairs of SAT chromosomes and 10 median or submedian chromosomes without any marked differences in length. The most conspicuous chromosomes in the diploid members of (2) are one pair of SAT chromosomes, one pair of subterminal and one pair of median and two pairs of submedian long chromosomes. The chromosomes of 2*x* representatives of (3) are similar to those of *H. vulgare* in that most of them are median or submedian without much difference in length. Two pairs of SAT chromosomes are present, one pair having a considerably larger satellite than the other. *H. californicum* contains one pair of SAT chromosomes, with the satellite longer than the central segment, one easily distinguishable pair of long subterminals and one pair of long medians, the remainder being median or submedian, with some approaching the subterminal type. Of the two SAT chromosomes in (5), one pair is the usual type while the second has a long satellite as in (4). Two pairs of short chromosomes, one near median and the other subterminal, one pair of long medians and two pairs of long submedians are distinguishable. Diploids in (6) contain one pair of SAT chromosomes and one pair of long subterminal to submedian chromosomes, the others being median or near median. *H. jubatum* has three pairs of SAT chromosomes, one pair of which possesses a large satellite while the other two are subterminal. The caryotypes of the 4*x* members of (2) and (3) are indicative of allotetraploidy. In the *bulbosum* group autopolyploidy has evidently occurred without change in the morphology of the chromosomes. Two abnormalities were observed in *H. jubatum*: a dicentric in some of the root-tip cells of one plant and a chromosome number of $2n = 42$ in another. It is concluded that the caryotype analysis has not provided evidence of any definite evolutionary trends, although it has established groups which should prove helpful in future investigations.

394 Morrison, J. W., Hannah, A. E., Loiselle, R. & Symko, S.
Cytogenetic studies in the genus *Hordeum*. II. Interspecific and intergeneric crosses.
Canad. J. Pl. Sci. 1959 : **39** : 375–83.

The results of over 100 interspecific and intergeneric crosses, in which the technique of embryo culture was employed, are reported from the Cereal Crops Division, Canada Department of Agriculture, Ottawa [cf. 393]. The majority of the crosses were between *H. vulgare* and wild species of *Hordeum*. Adult plants, in most cases completely sterile, were obtained from the following combinations: *H. brachyantherum* x *H. vulgare*, *H. californicum* x *Secale cereale*, *H. depressum* x *H. vulgare*, *H. depressum* x *S. cereale*, "hexaploid species" x *H. vulgare*, *H. jubatum* x *H. vulgare*, *H. jubatum* x *H. brachyantherum*, *H. jubatum* x *Hordelymus europaeus*, *H. jubatum* x unknown, IH74 (*H. jubatum* x *H. brachyantherum*) x *H. vulgare*, IH74 x *H. californicum*, *H. vulgare* x *H. bulbosum*, *H. vulgare* x *S. cereale* and *H. spontaneum* x *H. bulbosum*. No viable hybrids were obtained from interspecific crosses involving *H. murinum*, although more attempts were made to cross this species than with any other. Crosses involving *H. marinum*, *H. maritimum*, *H. hystrix*, *H. stenostachys* and *H. pusillum* also failed. With the exception of *H. vulgare* x *S. cereale*, all the interspecific and intergeneric crosses studied had at least one parent with 28 chromosomes. Future work will include chromosome doubling of the diploid species for use in crosses. More crosses will also be made between wild species of *Hordeum* rather than between *H. vulgare* and wild species.

395 Coenradie, J.
Mout- en brouwproeven op praktijkschaal, oogst 1957. **(Malting and brewing trials on a practical scale, 1957 harvest).**
23e Nacobrouw Jb. 1959 : 51–55.

Results of comparisons of malting and brewing quality of various barleys in the Netherlands are presented. Proctor and MGH 367/51 gave beers good in flavour. Balder was better than Carlsberg in malting quality but gave less stable beers.

396 Stern, R., Kearns, H. J. & Wright, G. M.
Barley quality tests. I. Variety trials.
NZ J. agric. Res. 1959 : **2** : 201–07.

Varietal differences in percentage extract determined by Pawlowski's method were established as a result of an analysis of grain samples from trials carried out at the Crop Research Division, Lincoln, NZ, in 1955 and 1956. Carlsberg had the highest percentage extract, followed by Piroline, Kenia, Research, Maythorpe and Proctor. In the case of kernel weight, N content and total and free amylase, more extensive data are required before the above varieties may be accurately evaluated in these respects. The varietal position in relation to the requirements of the malting industry in New Zealand is briefly considered.

397 Banasik, O. J. & Harris, R. H.
Determination of extract in experimental malting barleys by new micro-mashing and falling drop methods.
Wallerstein Labs. Commun. 1959 : **22** : 81–88.

The following method, devised at the North Dakota Agricultural Experiment Station, Fargo, is considered to be reliable for evaluating samples at an early stage in breeding. "In essence, the method provides for mashing 3·5 g. ground barley in a 50-ml. centrifuge tube with 25 ml. of water containing added α amylase and malt diastase. The mash is held for 18 hours in a water bath at 20° C., and the tube is then transferred to a specially constructed micro-mashing apparatus holding a number of such tubes. The mashes are carried through a described schedule of heating, cooling and filtration. Wort specific gravity is determined by a modification of the falling drop technique of Clendinnen depending on measurement of the time required for one drop to fall a given distance through a bromobenzene-kerosene mixture."

398 Moseman, J. G.
Host-pathogen interaction of the genes for resistance in *Hordeum vulgare* and for pathogenicity in *Erysiphe graminis* f. sp. *hordei*.
Phytopathology 1959 : **49** : 469–72.

Resistance to cultures 21·1 of race 9 and CR3 of race 3 of *E. graminis* f. sp. *hordei* depended on Ml_g in the variety Goldfoil and Ml_k in Kwan. In the culture CAN12 of race 12 there was a gene for virulence complementary to Ml_g designated V_g and one complementary to Ml_k designated V_k. In CAN12, CR3 and 21·1 the genotypes were V_gV_k, A_gA_k and A_gA_k respectively. A study of the progeny of the cross of cultures CAN12 and 21·1 showed that the frequency of the four possible genotypes fitted the 1 : 1 : 1 : 1 ratio expected if the genes V_g and V_k were inherited independently.

MILLETS AND SORGHUMS

399 Standel', M.
(*Setaria* in western Siberia).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 12 : p. 65. [Russian].

Mention is made of the recent varieties Novosibirsk 1 and Kamala which ripen their grain in the Kurgan and adjacent provinces. Kamala yields 18 c. grain and 120 c. green matter per ha.

400 Danil'čuk, P. V.
(The resistance of *Setaria* varieties to drought).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 6 : 61–63. [Russian].

S. viridis 'Bajljuša', 'Sigenbaj' and 'Džunecin' originating from arid districts of China were distinguished by drought resistance in comparison with many Soviet and introduced varieties tested in the Ukraine. Mention is made of highly productive families selected from Džunecin at the Agricultural Institute of the Nonchernozem Belt, in particular family 218 which outyields Bučanskaja 1 by a very considerable margin.

401 Yu, T.-F., Pei, M.-Y. & Hsu, H.-K.
(Studies on the red-leaf disease of *Setaria* millet. IV. The growth and development of red-leaf disease of *Setaria* millet and its control).
Chih-wu Ping-li-hsueh Pao (J. Pl. Path.)/ Acta phytopath. sin. 1959 : 5 : 12–20. [Chinese].

In the course of these investigations, some 200 varieties were tested for reaction to the above virus. Four varieties, P14A, NP–157, P354 and Hui-li, are tolerant.

402 Khan, A. R., Misra, K. P. & Mathur, B. P.
A promising 'bajra' variety for Delhi state.
Indian J. agric. Sci. 1958 : **28** : 57–60.

Data are given on the performance of improved varieties of *Pennisetum typhoides* from different parts of India, when tested in Delhi State. V6 (Pb. T–55) from the Punjab showed most promise and has been released to cultivators.

403 Divakaran, K., Anavaradham, L., & Dorairaj, V.
Parental affinities for grain size in Sorghum type, Periamanjal-Irungu.
Madras agric. J. 1959 : **46** : 211–16.

Periamanjal-Irungu is a dual-purpose type derived from Periamanjal (*S. durra*) x Irungu (*S. dochna*). In certain districts in Madras State, it has produced a higher yield of grains than the Irungu grain type and higher yield of forage than the Irungu forage type. It has however the defect of extreme disuniformity in grain size. An account is given of the method and results of selecting for uniformity in the character of bold grains. Hundred-grain weight showed a bimodal distribution, with the highest frequencies in the two parental classes. Selections have been developed which on the average have surpassed unselected Periamanjal-Irungu in grain yield by 34·10%.

404 Sorgos graníferos y forrajeros. **(Grain and forage sorghums).**
Idia 1959 : No. 134 : 1–31; and Informe espec. Estac. exp. Pergamino No. 1 : Pp. 48. (Mimeographed).

In this report of a conference held at the Manfredi Experimental Station, Argentina, on 23–24 July 1958, the following work is mentioned. F_2 material of the grain sorghum hybrids Dawn x Early Kalo, Redbine 60 x Early Kalo, Early Kalo x Spur Feterita, White Early Kalo x Spur Feterita and Wonder Club x DD Yellow Sonner Milo is under study at Manfredi. African varieties resistant to bacterial diseases are being used in breeding. At Anguil, a white-grained mutant of Doble Enano [Dwarf Double] has been obtained, which is thought to be more palatable to stock. A new variety, Napalpí, selected from Hegari at Sáenz Peña, forms a preliminary stage in the development of dual-purpose sorghums. A new productive forage variety of good quality developed at Oliveros has been named Paraná. At Manfredi, a new sweet sorghum named Mf 383 is leafy and has shown good resistance to diseases. Lines outyielding the parental material by 30% have been selected from the forage sorghum Leoti Red at Oliveros. In breeding *Sorghum almum*, selection for short, nonaggressive rhizomes has proved effective; selections C4, E12 and A33 have given good yields of forage. At Sáenz Peña, a dwarf broom sorghum, called Tenco, has been developed.

405 Zucchini, I.
Il sorgo ibrido come alternativá al granoturco. (**Hybrid sorghum as an alternative to maize).**
G. Agric. 1959 : **69** : p. 131.

Tests in various parts of Italy with six grain types and one forage type of hybrid sorghum, together with a number of open-pollinated varieties, showed the hybrids to be in general superior to the varieties, the best grain yields being obtained from Camelsorgo 210, 65 and 52 [cf. XXIX, 3880]. Yields of more than 80 c. per ha. were produced in the Rome area and one hybrid gave as much as 126 c. per ha. in the vicinity of Ancona. In the very poorest soils however the hybrids yielded slightly less than the best open-pollinated varieties.

The forage hybrid Camelsorgo BF is 5 days earlier than the variety Soave, though very slightly lower in yield; it also tillers better and gives more aftermath.

406 Clapp, A. L.
Kansas grain sorghum performance tests, 1958.
Bull. Kans. agric. Exp. Sta. 1959 : No. 403 : Pp. 15.

The results of tests of the performance of hybrids in comparison with standard varieties in different regions of Kansas are reported.

407 **RS608 is new Texas grain sorghum hybrid.**
Crops & Soils 1959 : **11** : No. 10 : p. 27.

Developed by the Texas and Nebraska Agricultural Experiment Stations in cooperation with the US Department of Agriculture, RS608 is a red-grained awnless variety originating from a cross between Martin and Combine 7078. It matures 90 to 100 days after planting and usually heads one or two days earlier than Martin. The heads are exserted well above the top leaf and this facilitates combining. The test weight per bushel is almost as high as that of Martin and in Texas during 1958 RS608 outyielded both parents but was surpassed by other hybrids. The new variety is similar to Martin in height and standing capacity; it is susceptible to head smut.

408 Hittle, C. N., McKibben, G. E. & Browning, D. R.
Grain sorghums. 1958 performance in Illinois.
Bull. Ill. agric. Exp. Sta. 1959 : No. 643 : Pp. 12.

Results of trials, in seven different localities, of varieties and hybrids are reported and combined with data from 1956 and 1957. The average yield of the hybrids was about 40% above that of the varieties.

409 Mahudeswaran, K.
Stigma receptivity in cytoplasmic male-sterile sorghum type under Indian conditions.
Madras agric. J. 1959 : **46** : 177–80.

Data on seed set by panicles of the male-sterile line A385, when pollinated on successive days after bagging in an experiment at Coimbatore, Madras, showed that the stigmas are capable of remaining receptive for up to 10 days after protrusion, as in the USA. Receptivity declined, however, after the fifth day.

410 Venkataraman, K.
A case of inherited proliferation in *Sorghum*.
Madras agric. J. 1959 : **46** : 230–31.

A plant of *S. subglabrescens* 'Co. 4' bore an abnormal type of panicle. In the lower part, bracts enclosed rudimentary spikelets in an axillary position. The bracts gradually diminished in length towards the upper whorls of the panicle. No grains were produced, although the upper spikelets possessed apparently fertile reproductive organs. The plant was propagated vegetatively from the axillary bud of the topmost node. A few seeds were obtained from spikelets in the upper portion of the abnormal panicles borne by the plant thus obtained. The progeny raised from these seeds bred true for the panicle abnormality and also produced some seeds.

411 Melton, B. A. (Jun.).
Some plant characteristics affecting yield in dwarf broomcorn.
Diss. Abstr. 1959 : **19** : LC Card Mic 58–5456 : p. 2425. (Abst.).

Five dwarf varieties showing a wide range in yield and plant type were grown at three different spacings. Significant differences between varieties were found in yield and in the number of heads per plant but the differences in head number were only apparent at the wider spacings. Tiller number seemed to be conditioned by many genetic and environmental factors. At the three-inch spacing, plants without tillers were most important in determining yield but at the 12 and 24 inch spacings the contributions of the tillers alone were about 50% of the yield in many varieties. There was some indication of a relationship between late maturity and an increase in tiller number, head weight, head length and stalk height. A correlation analysis showed that the number of heads per plant, head weight, head length, peduncle diameter and maturity period were the most important characters determining yield; of the characters studied, head length had the highest heritability, followed by head weight.

RICE

412 Marie, R. & Denoy, I.
La Rizière expérimentale du Merle en 1957. **(The Merle Experimental Rice Field in 1957).**
Progr. agric. vitic. 1959 : **76** : 93–101, 165–69, 186–92, 245–50.

Notes are given on the characteristics of a series of varieties from various countries and an account is given of breeding and testing in progress at Merle. Various hybrids are being studied; the best early ones are (Sesia x Allorio) E and (Balilla x Allorio) H and the best midlate hybrids are (Balilla x Sesia) O and (line 136 x S. Novelli) J.

413 López-Ríoboo Tenreiro, F., Oyanguren y Garcés de Marcilla, J. & Prieto Heraud, E.
Ensayos comparativos de variedades de arroz. **(Comparative trials of rice varieties).**
An. Inst. nac. Invest. agron., Madr. 1958 : **7** : 877–960.

Twelve varieties and four hybrids, tested in various regions of Spain in 1955, fell into three groups with high, intermediate and low yields respectively. In the first group were Sordo, Puebla Larga [Long Seed], line 136 and Balilla x Benlloch, while in the last were varieties higher in quality, namely Rinaldo Bersani, Insen x Tremesino [Three Months], Maracay and Arborio.

414 Seko, H.
(Double cropping of rice in warm regions).
Nogyo oyobi Engei/Agric. & Hort. 1958 : **33** : 177–81. [Japanese].

Data are provided on the performance of pairs of varieties suitable for growing in succession in a single season in the island of Kyushu.

415 Ghose, R. L. M. & Butany, W. T.
Botanical improvement of varieties—general characters of Indian varieties and the application of genetics to rice improvement.
Proc. Indian Acad. Sci. : Sect. B 1959 : **49** : 287–302.

The wide diversity of morphological and physiological characters in Indian varieties is briefly discussed. In an attempt to evolve improved varieties responsive to heavy manuring, 710 *japonica-indica* crosses have been made at the Central Rice Research Institute, Cuttack. Selection of local populations and numerous other crosses has also been carried out at this institute and elsewhere in order to produce varieties with high yield, early maturity and resistance to fungi, insect pests, lodging, shattering, drought and salinity. Some of the more successful crosses for one or several of these characters included T1145 x Ch2, T90 x T1031, Gimbozu x Indrasail, Norin 8 x Nangquot, (Adt. 5 x Co.15) x (Adt. 17 x Co.15), Luchai x Gurmatia x Burma 2 and T90 x AC517. Some introduced Chinese varieties have yielded well. A dwarf mutation, D102, with numerous ear-bearing tillers, has also been used for breeding with some success.

416 Alim, A. & Ullah, T.
Yield of new hybrid strains of rice in comparison to their parents varieties.
Agriculture, Pakistan 1958 : **9** : 340–42.

Six hybrid selections were tested for yield in comparison with the parental varieties for a five-year period at the Dacca Experiment Station, East Pakistan. The following were significantly higher in yield than all the parent varieties tested: 387 (Jhingasail x Latisail), 177 (Indrasail x Patnai 23) and 241 and 226 from Latisail x Dudsar.

417 Johnston, T. H., Cralley, E. M. & Henry, S. E.
Performance of rice varieties in Arkansas, 1953–1958.
Rep. Ser. Ark. agric. Exp. Sta. 1959 : No. 85 : Pp. 31.

On the basis of the above trials, a number of commercial varieties are recommended for Arkansas. Among experimental lines, the smooth-hulled short-grain form CI9373, the medium-grain varieties CI9414, CI9407 and two lines from Rexark x Asahi [Rising Sun] and the long-grain types CI9186 and CI9187 showed promise.

418 Mendiola, N. B.
Performance of Japanese and Formosan rice varieties in the Philippines.
Araneta J. Agric. 1958 : **5** : No. **1** : 58–79.

The results of trials of Japanese and Formosan varieties during the period 1942–1944 indicate that some Horai (=Peng-lai) varieties, particularly Tai-chu 65, could be grown commercially. At present the testing of *japonica-indica* hybrids is being carried out in the Philippines under the auspices of FAO.

419 CALILAP, F. S. & RAMOS, E. E.
Comparative tests of five palagad rice varieties under Pasig, Rizal, conditions.
Araneta J. Agric. 1958 : **5** : No. 2 : 1–20.

A comparative study was made at the Araneta Institute of Agriculture, Rizal, Philippines, of the germination, height, period to maturity, appearance, tillering capacity, lodging, shattering, yield and pest and disease resistance of the varieties Thailand, Intan, Peta, Malaman and Tjereh-mas. The mean yields of Intan and Thailand were both greater than the mean yields of Peta, Melaman and Tjereh-mas.

420 MOHAMMAD SHAFI, & MOHAMMAD ABDUL AZIZ.
The inheritance of anthocyanin pigment in the outerglume and apiculus of rice.
Agriculture, Pakistan 1959 : **10** : No. 2 : 217–32.

The inheritence of pigmentation in the outer glume and apiculus was studied in three crosses between the purple-leaved Kashmir variety Babir, on the one hand, and the promising Kangra varieties 100 Ramjiwain, 41 Lalnakanda and 72 Phulpattas, on the other. These crosses were made in an attempt to develop purple hybrids for introduction into the Kangra district so that wild rice could be rogued in the early stages from the fields. The presence of three complementary genes, designated Ap^1, Ap^2 and Ap^3, has been established. The purple colour of the apiculus is produced by the interaction of Ap^1 and Ap^2; the F_2 generation segregates in the ratio of 9 purple : 7 green. The gene Ap^3, established in the variety 100 Ramjiwain, produces purple colour in the apiculus. It has a stronger effect than Ap^1 and Ap^2, producing a deeper purple colour. Neither Ap^3 nor Ap^1 and Ap^2 produce colour in the outer glume, but Ap^3 in combination with Ap^1 or Ap^2 or both produces colour in this part. Thus, when the outer glume is coloured, the apiculus must also be coloured but the reverse is not true. Ap^2 and Ap^3 are closely linked, the cross-over value being 3·38 ± 0·73%. Ap^1 has been found to be linked with the genes *Ls* and *St* (responsible for producing colour in the leaf sheath and stigma respectively) and to have cross-over values of 11·91 ± 2·02 and 9·11 ± 1·83% respectively.

421 PAWAR, M. S.
Botanical improvement of rice varieties with special reference to crosses to improve agronomic characters.
Proc. Indian Acad. Sci. : Sect. B 1959 : **49** : 303–08.

As part of the International Rice Hybridization Project sponsored by FAO, an attempt to combine the high yielding quality of the round-grained *japonica* type with the adaptability of the long-grained *indica* to varying climatic and soil conditions, by crossing eight *indica* varieties with 14 *japonica* types in 44 different crosses, has been made at the Central Rice Research Institute, Cuttack. Hybrids combining several of the characters high yield, compact habit, medium height, flowering in 80–140 days from sowing, compact panicle, fine, coarse and medium grain, and resistance to shattering, lodging, *Schoenobius incertellus*, *Thrips oryzae* and *Piricularia oryzae* have been produced. The *japonica* parents Norin 18 [Ministry of Agriculture and Forestry 18], Norin 20, Norin 36 and Rikuu 132 proved to be better combiners for yield than Norin 6, Norin 8, Asahi [Rising Sun] and Gimbozu [Silver Bonze].

Under further projects of FAO to carry out such hybridization for specific areas, plans are being made to launch a breeding programme for Andhra Pradesh. In order to improve further the stocks of *japonica* and *indica* types maintained at different research centres, it is suggested that radioactive isotopes should be used to produce new, superior germ plasm.

422 OUANG [WANG], T.-Y.
Mutations provoquées par les rayons X chez le riz cultivé (*Oryza sativa* L.).
[Mutations induced by X rays in cultivated rice (*O. sativa* L.)].
J. Agric. trop. Bot. appl. 1958 : **5** : 681–90.

O. sativa subsp. *japonica* and subsp. *indica* were treated with X rays and various types of segregation into fertile, semisterile and sterile plants were found in subsequent generations. The PMCs of sterile plants showed quadrivalents and univalents at meiosis, a translocation having occurred. Mutant forms differing from normal plants in their shorter tillers, fewer panicles and different time of earing were produced; the mutant genes appeared to be recessive. *O. sativa* subsp. *japonica* seemed to be less resistant than *O. sativa* subsp. *indica* to X irradiation. Heritabilities for plant height, date of earing and panicle number were calculated.

423 Macuura [Matsuura], H.
(Two directions of Darwinism in Japan).
Agrobiologija (Agrobiology) 1958 : No. 6 : 50–53. [Russian].

This brief outline of the history of evolutionary thought in Japan mentions recent experiments on graft hybridization. True-breeding vegetative hybrids of *Oryza/Echinochloa* are said to have been obtained, which are characterized by resistance to disease and great earliness, enabling two harvests to be gathered in a year.

424 Piacco, R.
La razza 77. **(Race 77).**
Riso, Milano 1959 : **8** : No. 6 : 15–17.

The rice described, a hybrid from Lady Wright x Greppi, is popular in the Vercelli province of northern Italy on account of its combination of long, fine grain and early maturity, and in spite of its tendency to lodge.

425 Torres, J. P.
Some notes on the Quezon rice or Raminad III.
Pl. Industr. Dig., Manila 1959 : **22** : Nos. 1–3 : 5–8, 14.

An account is provided of various aspects of the development of Raminad 3, a lowland rice grown in the Philippines and also known as Raminad or Quezon. It was derived from a cross of Ramai x Inadhica made by the author in 1928. The variety is notable for its yield, quality and resistance to *Leptosphaeria salvinii* and other important diseases.

426 Reyes, G. M.
On the creation of Raminad strain 3.
Pl. Industr. Dig., Manila 1959 : **22** : Nos. 1–3 : 9–11, 14.

The article deals chiefly with (1) the work of testing for reaction to *Leptosphaeria salvinii* which was entailed in the development of the above rice variety and (2) the problem of the nomenclature of the variety [cf. 425].

427 Reyes, G. M.
Explanatory notes regarding the use of the name Ramay or Ramai.
Pl. Industr. Dig., Manila 1959 : **22** : Nos. 1–3 : 12–14.

The author discusses the confusion surrounding the use of Ramay and Ramai, the names of two varieties introduced into the Philippines before World War I from Saigon. He contends that the parentage of Raminad 3 was Ramay x Inadhica [cf. 425].

428 Cada, E.
Brief historical notes on the Seed Board approved rice varieties.
Pl. Industr. Dig., Manila 1959 : **22** : Nos. 1–3 : 15–16.

Information is given on seven upland and seven lowland varieties, with respect to their origin and history prior to their distribution in the Philippines.

429 Peltier, M. A. G.
Note préliminaire sur le nombre chromosomique d'*Oryza perennis* Moench., ssp. *madagascariensis* (A. Chev.) Rosh. **[A preliminary note on the chromosome number of *O. perennis* Moench., subsp. *madagascariensis* (A. Chev.) Rosh.].**
J. Agric. trop. Bot. appl. 1958 : **5** : p. 765.

The chromosome number of this plant was found to be $2n = 24$. All attempts at crossing it with *O. sativa*, *O. glaberrima* and *O. perennis* subsp. *barthii* at the Agronomic Research Institute in Madagascar have so far been unsuccessful.

430 Sone, K.
Studies on the quality of the plant food. II. Influence of variety and environment upon the riboflavin content of hulled rice. (2) In special reference to its effective factors.
Tôhoku J. agric. Res. 1959 : **9** : 179–97.

Variety and fungicidal treatment proved to be the main factors affecting riboflavin content. Varietal differences in this property are ascribed to disparities in environmental adaptation.

431 Umino, S., Iizuka, S., Nonaka, F. & Yuyama, H.
(Studies on methods of growing lowland rice in irrigated upland fields. I. Adaptability of lowland rice varieties to irrigated upland fields. II. Differences between lowland and upland rice in growth and physiological characteristics when grown under these conditions).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1959 : **27** : 349–53. [Japanese].

The relative suitability of lowland varieties for growing in upland irrigated fields was investigated during 1955–57. The best lowland variety for this method of cultivation was Obanazawa 6, which exceeded the upland variety Norin 12 [Ministry of Agriculture and Forestry 12] in number of spikelets per panicle.

432 Yamakawa, Y. & Nishiyama, H.
(Studies on the cultivation period of rice in warm regions. I. On the influence of shifting the cultivation period on various characteristics of rice and on varietal differences in this respect).
Saga Daigaku Nogaku Iho/Agric. Bull. Saga Univ. 1958 : No. 7 : 1–48. [Japanese].

A series of varieties varying in vegetative period from very early to very late were investigated during 1952–4 in the island of Kyushu. Sowings were made at dates ranging from March to August and observations were made on tillering, heading date, maturation date, leaf number, plant height, stem number, internode length, leaf-blade length, straw and panicle weights, number of unfertilized spikelets, number of unfilled grains, 1000-grain weight and incidence of shedding. The influence of sowing date and variety on the various characters was ascertained and regression formulae showing the effect of sowing date on these characters for each variety were calculated. The effect of temperature during the growing period was also studied.

433 Fujii, Y. & Tanaka, N.
(On guttation in rice seedlings with reference to the earliness or lateness of the varieties).
Saga Daigaku Nogaku Iho/Agric. Bull. Saga Univ. 1957 : No. 5 : 23–32. [Japanese].

[Cf. XXVIII, 520.

434 ten Have, H.
Proefnemingen over de optimale zaaidichtheid van verschillende rijstrassen onder uiteenlopende groeiomstandigheden. **(Experiments on the optimum seed rate of various rice varieties under different growing conditions).**
Surinaam. Landb. 1959 : **7** : 1–12.

Under normal conditions no differences in optimum seed rate were observed among the varieties studied. Under very favourable conditions, however, Dima and especially Paradijs [Paradise] had lower optimum rates than the others.

435 Chalam, G. V.
Botanical improvement of rice with special reference to wide crosses.
Proc. Indian Acad. Sci. : Sect. B 1959 : **49** : 309–18.

The possibilities of breeding improved varieties that are responsive to heavy manuring by crossing the *japonica* type with the *indica* type are discussed. Twenty-seven such crosses have been made in Orissa under the auspices of FAO. The two most promising crosses, Asahi [Rising Sun] x T812 and Norin 6 [Ministry of Agriculture and Forestry 6] x T812, are responsive to heavy manuring but retain the quality of the *indica* type of grain. Both hybrids are also free from lodging, highly fertile and of short to medium height.

436 Johnston, T. H., Cralley, E. M. & Henry, S. E.
Straighthead and rice varieties in Arkansas.
Arkans. Fm. Res. 1959 : **8** : No. 2 : p. 2.

Varieties in two tests were found to differ in their degree of susceptibility to straighthead. Cody, Nato and Caloro proved to be the most resistant varieties and Sunbonnet the most susceptible variety. The long-grained varieties were more susceptible than the short or medium grain type; Bluebonnet 50 was most resistant, showing 20% sterility as an average of the two tests.

437 Kozaka, T., Sonku, Y. & Fukushiro, K.
(Studies on *Corticium sasakii* affecting rice. I. On escape of injury by late varieties).
Chugoku Nogyo Shikenjo Hokoku/Bull. Chugoku agric. Exp. Sta. : Ser. A 1954 : No. 3 : 74–88. [Japanese].

A comparative study of an extensive series of Japanese varieties showed that lateness is negatively correlated with injury from the above disease. Possible causes for this effect include the greater leaf number of late varieties, the later emergence of the leaves and retardment of fungal development by the lower temperatures later in the season.

438 Padmanabhan, S. Y.
The present position and control of rice diseases in India.
Proc. Indian Acad. Sci. : Sect. B 1959 : **49** : 349–62.

Included in this summary is an account of attempts to control blast (*Piricularia oryzae*) by breeding resistant varieties [cf. XXVII, 1827]. Fourteen selected varieties from the Central Rice Research Institute, Cuttack, have been found to be more or less resistant in different localities throughout India situated at or below 3000 feet. Selection from a further 290 varieties is in progress at Cuttack. Resistant varieties isolated in Madras and Bombay State, Andhra Pradesh and Hyderabad include Co.4, TKM1, BCP1, BCP2, HR1 and HR35. Resistant hybrid selections, Co.25, Co.26, ADT25, T6517, T6522, T6538 and others have been or are about to be released in Madras State. More recently, progenies from GEB24 x Co.4 and Co.25 x Co.13 have shown promise. Results of tests to determine the reaction to blast of susceptible and resistant varieties received from different countries at Cuttack are tabulated. These show that there is a large reservoir of resistant material for future breeding.

439 KULKARNI, N. B., PATEL, M. K. & DESAI, M. K.
Physiologic specialization in *Piricularia oryzae* Cav. in India.
Poona agric. Coll. Mag. 1959 : **49** : 227–31.

Three races of the above pathogen have been identified.

440 WAKIMOTO, S. & YOSHII, H.
(Polyphenol composition of plants and phytophathogenic fungi. On the polyphenol content of rice).
Nihon Shokubutsubyori Gakkai Ho/Ann. phytopath. Soc. Japan 1958 : **23** : 79–84. [Japanese].

More than eight polyphenols have been differentiated by paper chromatography in a series of Japanese and introduced varieties. Differences between Chinese and Japanese varieties in respect of polyphenol composition are noted. A correlation appears to exist between resistance to blast and quantity of polyphenols staining red with Arrow's reagent.

441 OKAMOTO, D. & YASUBE, G.
(Intervarietal differences in injury caused to rice by *Chilo simplex*).
Nogyo oyobi Engei/Agric. & Hort. 1958 : **33** : p. 58. [Japanese].

In a comparative study of a series of Japanese varieties and of some F_1 hybrids between them, correlations were noted between (1) injury by the first brood, on the one hand, and number of stems and plant height, on the other, and (2) injury by the second brood, on the one hand, and number of panicles, straw length, leaf breadth and heading period, on the other. Most of the F_1 hybrids were more heavily attacked by both broods than either of their parents.

442 HERNAEZ, A.
A study on certain agronomic characters of twenty-two lowland rice varieties planted in different months of the year.
Araneta J. Agric. 1956 : **3** : No. 2 : 67–92.

Twenty-two different rice varieties were planted each month in pot cultures for 12 consecutive months and treated as if under lowland conditions. The light-sensitive varieties, which grow vegetatively during the long days from June to October, were found to include one early lowland rice, Apostol, and all the medium-late and late maturing lowland varieties. The insensitive varieties included the early lowland varieties Guinangang, Brondol Putih, Tjereh Mas, Peta, Malaman, Intan and upland Palawan. The upland varieties Carreon and Carti 42 were partially insensitive as they flowered irregularly and gave responses intermediate between those of the sensitive and insensitive varieties.

443 OKA, H.-I.
Variations in temperature responses among cultivated rice varieties.
Phyton, Vicente López 1959 : **12** : 1–11.

The effects of temperature upon germination, tillering, rate of elongation of the plant during the tillering period, length of growth period and culm and panicle length were determined in sowings at monthly intervals throughout the year for several years in Taiwan. About 160 varieties from different Asiatic countries were studied. To measure the temperature responses of the various characters, the coefficients of regression or partial regression were estimated for each variety and expressed in terms of the percentages of the mean measurements of the given variety. Compared with varieties of the *japonica* or Insular group, varieties belonging to the *indica* or Continental group had higher rates of acceleration in vegetative growth per unit rise in temperature and lower rates of advancement in time of initiation of the flower primordia per unit rise in temperature. The *indica* varieties may therefore be more adaptable as regards vegetative growth under conditions of high temperature. Their generally low yield in tropical countries may be due to their lower responses to fertilizers. Unlike photoperiodic responses, reactions to temperature failed to show a latitudinal cline [cf. XXIX, 2697]. Temperature responses may not therefore be directly subjected to selection pressure.

FORAGE GRASSES

444 CYBULSKI, Z.
Zagadnienia hodowli traw i motylkowych dla potrzeb łąkarstwa. **(Problems of breeding grasses and legumes for grassland requirements).**
Postępy Nauk Roln. 1958 : **5** : No. 4 : 63–104.

Methods of breeding and selection, including the development of synthetic and heterotic varieties and the use of polyploidy, are outlined for the benefit of Polish readers.

445 TARKOWSKI, C.
Poliploidalność u traw i jej znaczenie dla hodowli roślin. **(Polyploidy in grasses and its significance for plant breeding).**
Postępy Nauk Roln. 1958 : **5** : No. 3 : 55–64.

In this general review the relationship of chromosome number to vigour and other qualities is surveyed for a number of species; tetraploid to octoploid forms are generally best. In Poland, chromosome doubling in *Lolium perenne, L. multiflorum, Beckmannia cruciformis* and *Cynosurus cristatus* is being undertaken.

446 HULEWICZ, D.
O niektórych metodach kolchicynowania traw. **(On some methods of colchicine treatment of grasses).**
Roczn. Nauk rol. : Ser. A 1958 : **79** : 139–49.

The method involves the application of an aqueous solution of colchicine to seedlings whose coleoptiles have been cut down as far as possible, care being taken to remove all air bubbles either by means of a vacuum pump or by cutting the seedlings when covered with solution. Optimum concentrations and duration of treatment varied for different species. The effect of an increase in temperature from 15° C. to 30° C., studied in *Festuca pratensis*, was a marked increase in number of polyploid cells.

447 GHOSH, A. L. & KNOWLES, R. P.
Scissor emasculation of perennial grasses.
Agric. Inst. Rev. 1959 : **14** : No. 3 : p. 32. (Abst.).

Clipping of the florets so as to remove "a portion of the anthers" was found to be an effective method of emasculation in *Bromus, Agropyron cristatum* and *Elymus junceus*.

448 OLSEN, F. J.
An evaluation of the salt tolerance of particular varieties, strains, and selections of three grasses and two legumes.
Abstr. Thes. Utah St. Univ. 1958 : **6** : No. 3 : p. 27.

A study was made of the effects of increasing degrees of salinity upon the growth, yield, survival and chemical composition (Na, K and Ca) of strains, varieties and selections of *Elymus canadensis, Phalaris arundinacea, Agropyron elongatum*, lucerne and strawberry clover. The artificially salinized field-plot technique was employed. Significant intraspecific differences in salt tolerance were found, suggesting that scope exists for the development of varieties for saline soils.

449 DUICH, J. M. & MUSSER, H. B.
The extent of aberrants produced by Merion Kentucky bluegrass, *Poa pratensis* L., as determined by first and second generation progeny tests.
Agron. J. 1959 : **51** : 421–24.

P. pratensis 'Merion' proved to be highly apomictic. The frequency of aberrants found in progeny tests of two generations averaged from 2·8 to 4·2%. Although the average percentage of aberrants derived from polyembryonic seedlings was 12·3%, the production of aberrants by this strain should not be affected significantly by the occurrence of such seedlings, since their frequency was less than 2% for the two generations. The 50 aberrants among the 120 first-generation plants chosen for progeny testing in the second generation fell into two classes. Complete segregation was observed in the progenies of 36. The remaining 14 plants were apomictic, as judged by the morphological resemblance between them and their progenies. Aberrants sufficiently vigorous to compete with the apomicts typifying the strain occurred in a relatively low frequency, about 19% of the total number of first-generation aberrants or about 0·76% of the total progeny being classified as plus or equal, on the basis of growth, vigour and seed production when compared with Merion. The authors stress the importance of second-generation progeny tests for verifying the classifications of first-generation plants and for securing information on "advanced-generation" performance. Several rust-resistant individuals of the Merion type have been selected but it has not yet been ascertained whether these have retained the resistance of the strain to *Helminthosporium vagans*. [Cf. XXVIII, 1359].

450 JOWETT, D.
Adaptation of a lead-tolerant population of *Agrostis tenuis* to low soil fertility.
Nature, Lond. 1959 : **184** : p. 43.

In a recent investigation by Bradshaw and Snaydon [XXIX, 2704] no differentiation was found in *A. tenuis* with respect to adaptation to different concentrations of Ca. Further work has however indicated that such differentiation does exist in this species. In sand-culture experiments on a lead-mine population from a locality in Wales and a population from a neighbouring pasture, the former showed adaptation to low concentrations of Ca and P.

451 Østgård, O.
Forsøk med timoteistammer. (**Trials of timothy strains**).
Forskn. Fors. Landbr. 1959 : **10** : 265–73.

Ten Norwegian, nine Canadian, six Finnish, three Swedish and one Scottish strain were tested at the Norwegian station at Holt during the periods 1939–41 and 1947–57. Strains from northern Norway were more winter hardy, showed greater persistence and produced higher yields of hay than those from southern Norway or other countries. Engmo was the best strain.

452 Christie, B. R. & Kalton, R. R.
Sampling for seed weight determinations in bromegrass, *Bromus inermis* Leyss.
Canad. J. Pl. Sci. 1959 : **39** : 158–63.

As increased seed weight has become an important breeding objective in several perennial grasses, this study has been undertaken to calculate the optimum sample size of bromegrass seeds and the number of samples needed for determining seed weight. Top-cross seeds of five clones were used. Variables considered were number of seeds per sample, number of samples, counting time, weighing accuracy and weighing time. Using coefficients of variation as estimates of statistical precision, it was found that two samples of 50 or 100 seeds per clone resulted in maximum efficiency. For practical purposes, a sample size of 50 seeds has certain advantages.

453 Truscott, J. D.
Genetic and environmental factors in breeding smooth bromegrass, *Bromus inermis* Leyss.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–1150 : p. 2202. (Abst.).

A summary is provided of the results of an evaluation of northern and southern strains introduced in Manitoba, with respect to seed yield and its components and forage yield, using two levels of N application and two methods of planting. Estimates of genotypic variation for seed yield and its components among plants in the spaced planting constituting one of the tests are also given. Estimates of this variation were respectively 39, 16 and 68% for seed yield, panicle production and fertility index. Individual-plant variability appeared to be sufficiently high to permit selection. Panicle production was markedly affected by the environment and selection for change in this character would probably be more successful in progeny tests without spacing.

454 Martin, G. J.
Investigations on strains of perennial ryegrass.
Tasm. J. Agric. 1959 : **30** : 77–87.

Trials in three localities in Tasmania have demonstrated the superiority of several Tasmanian local lines over the New Zealand certified strain in productivity and persistence. Tasmanian 1 has shown most promise and steps have been taken to include it in the seed certification scheme. Breeding is under way to develop a synthetic incorporating the desirable features of this strain and several others.

455 Hertzsch, W.
Beobachtungen an künstlich hergestellten polyploiden Futterpflanzen. 3. Welsches Weidelgras (*Lolium multiflorum*). (**Observations on artificially produced polyploid fodder plants. 3. *L. multiflorum***).
Z. Pflanzenz. 1959 : **41** : 271–93.

Artificial tetraploids of *L. multiflorum* were compared with the original diploids in tests held at Vogelsang and Scharnhorst, the two localities differing in respect of soil and climatic conditions. The tetraploids in the C_2 generation had higher total weights than the diploids, the difference being about 25%. In both the first and second cuts the diploids had on the whole most leaves, stems and inflorescences but the number of spikelets and flowers per inflorescence was similar in both forms. A few of the tetraploids approached the diploids in respect of tillering capacity and by selecting such types it would be possible to improve the yield of fresh matter. The yield of dry matter of the tetraploid lines was lower than that of the diploids at both localities in the first and second cuts; the yield varied between 86·7 and 91·4% of that of the diploids. Since the tetraploids showed some variation in yield of dry matter, it would be possible to improve this yield by selection from large populations. The ratio of the dry-matter content of the stem to that of the leaf was almost the same in diploid and tetraploid lines. Also the content of crude protein in both first and second cuts was very similar in diploids and tetraploids but the variation found indicated that selection for improved protein content would be worthwhile. Amongst 34 tetraploid progenies, 18 were much more winter hardy than the corresponding diploid; this may be due to the tetraploids having more genes for winter hardiness. Also the tetraploids have stronger roots which are less susceptible to damage by frost.

The pollen of the tetraploids was on the whole as fertile as that of diploids. Amongst the diploids the lowest value for pollen fertility was 43·0% and the highest 96·3%, the corresponding values for the tetraploids being 52·0% and 97·0%. Seed set under conditions of open pollination was on the average slightly higher in the diploids than in the tetraploids but in both forms there was considerable variation, the highest values in each case being between 72 and 75%. Seed set after selfing was only 0·26 and 0·24% for the diploids and tetraploids respectively and the seed obtained was rather shrivelled. The 1000-grain weight of the tetraploids was 188% of that of the diploids.

A better seed set was obtained from the cross diploid x tetraploid than from the reciprocal cross. When diploids and tetraploids were grown close together, the seed set of both was reduced.

The first inbred generation of the tetraploids showed no depression but the diploids showed a fall of 45–50% in total weight and in the weight and number of leaves, stems and ears produced. [Cf. XXV, 2104 and 2109].

456 Maiss, I.-M.

Morphologische Untersuchungen an Spelzfrüchten von Glatthafer (*Arrhenatherum elatius* J. et C. Presl) als Grundlage für die Züchtung drillfähiger Formen. **(Morphological investigations on husked spikelets of *A. elatius* J. et C. Presl as a basis for the breeding of forms which may be drilled).**

Z. Pflanzenz. 1959 : **41** : 123–50.

Variation in size and form of the inflorescence was found in varieties, breeding lines and other material collected from various localities in Germany. Also, when spikelets of similar ages and weight were mechanically rubbed, differences were noted in the readiness with which the glumes separated from the grain and the degree of closure of the glumes varied. Both within and between varieties there was variation in the number and length of the hairs at the base of the spikelets. The position of the spikelet in the inflorescence also affected the number of basal hairs. Spikelets with marked basal hairiness tended to have more hairs on the flowering glumes than spikelets with few basal hairs and the hairy spikelets also tended to have a bent awn in the hermaphrodite flowers. None of the spikelets examined lacked a bent awn and frequently two were found. Some plants had spikelets without basal hairs but the mode of inheritance of this character was not ascertained. Lack of hairs was not found to be associated with any other morphological character. The nonhairy grain is more suitable for drilling because the grains are more easily separated from one another.

457 Celarier, R. P. & Mehra, K. L.

Desynapsis in the Andropogoneae.

Phyton, Vicente López 1959 : **12** : 131–38.

Meiosis was studied in desynaptic plants of *Sorghum nitidum* ($n = 5$) and *Dichanthium annulatum* ($n = 20$). Pachytene in the latter species was not however sufficiently clear for investigation. Observations at pachytene in *S. nitidum* showed that almost all the chromosomes were paired, the amount of pairing undergoing a steady decrease as meiosis continued. At metaphase I, *S. nitidum* and *D. annulatum* had an average of 2_{II} and $3{\cdot}4_{\text{II}}$ per cell, respectively. Lagging univalents were common at anaphase and telophase I in both species and were usually dividing. Bridges and fragments were occasionally seen at these two stages in *S. nitidum* but not in *D. annulatum*. Laggards, usually not dividing, were also observed at meiosis II. Micronuclei occurred at the dyad and tetrad stages. Both species were typical examples of the type of desynapsis termed medium-strong by Prakken [XIII, 1238].

458 Celarier, R. P., Mehra, K. L. & Wulf, M. L.

Cytogeography of the *Dichanthium annulatum* complex.

Brittonia 1958 : **10** : 59–72.

Fifty-eight accessions of *D. annulatum*, representing entries from almost the entire range of the complex, have been studied cytologically and morphologically at the Oklahoma Agricultural Experiment Station. Four accessions were diploid ($2n = 20$), seven hexaploid ($2n = 60$) and the remaining 47 tetraploid ($2n = 40$). In general, three morphological categories are distinguishable, respectively termed the tropical, Mediterranean and South African types [cf. XXVI, 2445]. The diploids are all of the tropical type and similar in morphological appearance to tetraploids of this type. They have been found only in the Gangetic plain of northern India. The hexaploids are all of the South African type and appear to be confined to southern Africa. Tetraploids representing the Mediterranean and tropical types have been found; a few could not however be assigned to either of these categories. The tetraploids are distributed throughout the range of distribution of the complex. Twenty accessions, comprising 4 diploids, 12 tetraploids and 4 hexaploids, were subjected to detailed cytological investigation. The diploids were all regular in meiosis. Without exception, the hexaploids were highly irregular meiotically. The tetraploids varied considerably in frequencies of the various abnormalities and were broadly distinguished into two groups, slightly irregular and extremely irregular meiotically, nine of the tetraploids falling into the first group and the remaining three into the second. On the whole, the irregularities in the tetraploids and hexaploids were typical of those associated with polyploidy and interspecific hybridization. As reported elsewhere [cf. 459], the diploids appear to be completely sexual whereas the polyploids are predominantly apomictic, probably being pseudogamous. The following working hypothesis concerning the origin of the chromosome races and morphological types is suggested. Tetraploids of the tropical type probably arose through crossing between two genetically diverse diploids and subsequent chromosome doubling, a segmental and sexual allotetraploid being produced. Facultative apomixis later became established in the extremely polymorphic tetraploid population which evolved. The Mediterranean type, which is slightly more meiotically irregular than the tetraploid tropical type, may be the product of introgression of genes from a *Bothriochloa* sp. into the tropical type. Tetraploid accessions, highly irregular meiotically and not fitting into any of the three main morphological types, may also be the result of introgression, either by a second *Bothriochloa* sp. or by another *Dichanthium* sp. Such introgression is probably occurring at the present time. The hexaploids probably possess a genome which is absent in the tetraploid members of the complex. Possibly most of the morphological characters differentiating the hexaploids may be found in the closely related South African species *D. aristatum.* The hexaploid South African type may therefore have originated through fertilization of an unreduced egg of the tropical type of *D. annulatum* by a reduced gamete of *D. aristatum* or *vice versa.*

459 Celarier, R. P. & Harlan, J. R.
Apomixis in *Bothriochloa, Dichanthium* and *Capillipedium*.
Phytomorphology 1957 : **7** : 93–102.

In interspecific and intergeneric crosses involving members of the above taxa, *D. annulatum* ($2n = 40, 60$), *D. caricosum* ($2n = 40$), *B. venusta* ($2n = 40$), *B. caucasica* ($2n = 40$), *B. intermedia* ($2n = 40$), *B. pertusa* var. *insculpta* ($2n = 60$), *B. ischaemum* ($2n = 40, 50, 60$), *C. parviflorum* ($2n = 40$) and *C. spicigerum* ($2n = 40$) were highly apomictic and probably pseudogamous. *Dichanthium* was however considerably more sexual than *Bothriochloa* at the tetraploid level, facultative apomicts being common. Only one species of *Bothriochloa, B. venusta*, showed a tendency towards sexuality. The absence of a groove in the pedicel of the pedicellate spikelet in this species is a *Dichanthium* character whereas other features of the species are of the *Bothriochloa* type. *B. venusta* therefore appears to bridge the morphological gap between the two genera and is likely to be of hybrid origin. The $2n = 20$ types of *D. annulatum* and *D. sericeum* appear to be completely sexual. The reliability of the emasculation technique was checked by means of the diploid of the former species. The various hexaploid types are obligatory apomicts. In view of their tendency to be irregular in meiosis, this mode of reproduction may be expected to have a strong selective advantage.

460 Adati [Adachi], S., Mitsuishi, S. & Ujihara, A.
(Studies on breeding wild Japanese grasses as forage crops. VI. On some morphological variants of *Miscanthus* plants).
Nihon Sochikenkyukai Shi/J. Jap. Soc. Herb. Crops Grassland Frm. 1957 : **3** : 22–25. [Japanese].

Biometrical variation in lamina length, culm length, ear length and habit in Japanese samples of *M. sinensis* is described. Three habit types, erect, decumbent and prostrate, are distinguished. [Cf. XXVIII, 1750–1].

461 Burton, G. W.
Breeding methods for pearl millet (*Pennisetum glaucum*) indicated by genetic variance component studies
Agron. J. 1959 : **51** : 479–81.

In 18 forage-yield trials, 818 single crosses involving 296 inbred lines were compared and considerable variation was found between inbred populations in the amount of nonadditive genetic variance. On the average, 55·9% of the total genetic variance for forage yield was nonadditive. This indicated that forage yield will be rapidly increased by using F_1 hybrids. The variety Starr, a stabilized synthetic, has shown an advance in forage yield over that of common millet equal to 33·5% of the advance obtained with the F_1 hybrid Gahi–1.

462 NAKAJIMA, G.
(The chromosomes of 2 species of *Haynaldia*).
Senshokutai (Chromosome)/Kromosomo 1958 : No. 39 : 1345–48. [Japanese].

The course of meiosis in *H. villosa* and *H. hordeacea* is described. In both cases $n = 7$ and very few meiotic irregularities occur. No plants resulted from attempts to hybridize the two species.

463 CICIN, N. V. & GRUZDEVA, E. D.
[A hybrid of *Agropyron glaucum* Roem. et Schult. x *A. repens* (L.) P.B.].
Bjull. glavnogo Bot. Sada (Bull. princ. Bot. Gdn.), Moskva-Leningrad 1959 : No. 33 : 53–60. [Russian].

By pollinating an annual form of *A. glaucum* with a central Russian form of *A. repens*, 9 grains were obtained; they were germinated on an artificial medium and gave rise to 3 hybrid seedlings, which were very vigorous, stoloniferous and winter hardy; their ears were 20 cm. in length and bore 20–26 spikelets, with 6–9 florets in each. The hybrids were intermediate between the two parent species in most morphological features.

The chromosome number of the hybrid was $2n = 42$ as in the parents. Some 18% of the pollen grains were normally developed but all three hybrids were self sterile.

464 SAKAMOTO, S.
A new early ecotype of *Agropyron tsukushiense* var. *transiens* Ohwi.
Wheat Inform. Serv. Kyoto 1959 : No. 8 : 8–10.

An ecotype of *A. tsukushiense* var. *transiens* ($2n = 42$), distinguished from the common form by flowering about 25 days earlier and several morphological features, has been found in Japan.

465 BAENZIGER, H. & KNOWLES, R. P.
Supernumerary chromosomes in crested wheat grass.
Agric. Inst. Rev. 1959 : **14** : No. 3 : p. 33. (Abst.).

Four populations of *Agropyron desertorum* were studied meiotically. Out of 14 plants of the variety Summit chosen at random, 28·6% had $2n = 28$, the remainder also having 1–4 supernumeraries. In a group of desirable selections of Summit, a group of selections from strain S–841 and a third of selections from strain S–1333, 24·0, 20·7 and 63·1% of the plants had the normal complement of $2n = 28$. In a strain of *A. cristatum*, 4·2% of the plants had the normal set of 14 chromosomes at meiosis. In adventitious roots of the strain all the cells examined had $2n = 14$ but supernumeraries were observed in primary roots and coleoptiles. A study of the inheritance of supernumeraries in *A. cristatum* indicated that they are distributed at random at ♀ meiosis but undergo directed disjunction towards the generative nucleus in ♂ gametogenesis. Preliminary data suggest that plants with supernumeraries in this species tend to have lower floret fertility and weight but increased height.

LEGUMINOUS FORAGE PLANTS

466 HOWE, W. L. & MANGLITZ, G. R.
Insect-resistant crops.
Neb. Exp. Sta. quart. 1959 : **6** : No. 2 : 3–5.

By means of tests of plant survival in lucerne populations infected with spotted aphid and studies of the ability of the aphid to survive and reproduce on individual plants, resistant selections have been made. Lucerne varieties resistant to the pea aphid and the potato leafhopper are also being sought and varietal resistance to the clover seed chalcid is being studied.

In sweet clover, sources of aphid resistance have been found.

467 LAGERQUIST, R.
Jämförelse mellan några olika lusernstammar insådda med och utan skyddssäd. **(Comparison of different lucerne strains sown with and without a cover crop).**
Medd. Jordbruksförs. 1959 : No. 98 : Pp. 20.

Of six strains tested at Ultuna, Sweden, Alfa was the best in three-year leys with a cereal cover crop, while Alfa and Grimm were equally productive and better than the other strains when sown without a cover crop.

468 KEHR, W. R.
Alfalfa with hybrid vigor.
Neb. Exp. Sta. quart. 1959 : **5** : No. 4 : 6–7.

The possibilities of producing first-generation synthetics and single-cross and double-cross hybrids showing hybrid vigour are being studied at Nebraska Agricultural Experiment Station. Certain selected parents have given good hybrids and can be propagated vegetatively, and three experimental first-generation synthetics resistant to spotted aphid and bacterial wilt show promise.

469 KEHR, W. R.
Origin and performance of Ranger alfalfa.
Res. Bull. Neb. agric. Exp. Sta. 1959 : No. 188 : Pp. 20.

Recent tests of the wilt resistance, frost survival and forage yield of Ranger indicate that these characters have been maintained in foundation and registered seed produced within its area of adaptation and in certified seed produced elsewhere since its release [cf. XV, 537 and 645].

470 NENAROKOV, M. I. & ZVESKIN, M. G.
(The lucerne Pavlovsk 7).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 6 : 59–60. [Russian].

Pavlovsk 7 was obtained by hybridization of a water-meadow form in the province of Voronež with yellow lucernes from other districts. It is winter hardy and drought resistant, long-lived and more tolerant of flooding than blue hybrid lucernes. It outyields Zajkevič and is superior to it in resistance to diseases.

471 CLEVELAND, R. W. & STANFORD, E. H.
Chromosome pairing in hybrids between tetraploid *Medicago sativa* L. and diploid *Medicago falcata* L.
Agron. J. 1959 : **51** : 488–92.

When crosses were made using diploid *M. falcata* as the female parent, all the hybrids were tetraploid ($2n = 32$); presumably unreduced eggs had been fertilized by normal sperm. The reciprocal cross yielded two tetraploid hybrids and one triploid resulting from the union of unreduced gametes of both species. At metaphase I the frequencies of multivalents were very similar in autotetraploid *M. falcata* and in the tetraploid hybrids; the multivalent frequencies were lower in the parental *M. sativa* plants than in either *M. falcata* or in the hybrids. It appeared that the gross homology between chromosomes of *M. falcata* and *M. sativa* was of a high order in the hybrids. *M. sativa* appears to deviate from true autotetraploid behaviour at meiosis. It is suggested that either structural differences exist within the chromosome complement of *M. sativa* or that there is a genetic system controlling chromosome association. The origin of *M. sativa* is discussed. Studies of selfed generations of a tetraploid hybrid with the abnormality folded leaf indicated that this character, which is controlled by a single gene, is inherited on a tetrasomic basis. Absolute selective pairing between chromosomes of the same origin did not occur in the hybrid.

472 NAVARRO, G., ROSENGURTT, Z. & DI MURO, J.
Producción de poliploides en *Medicago hispida confinis*. **(Production of polyploids in *M. hispida confinis*).**
Rev. Asoc. Ing. agron., Montevideo 1958 : **30** : No. 103 : 5–8.

Colchicine-treated seeds of *M. hispida* var. *confinis* produced tetraploids which were highly variable in appearance, earlier than the diploid and more productive of forage but produced fewer seeds and tended to lose their leaves at the end of the season.

473 STANDFORD, E. H.
The use of chromosome deficient plants in cytogenetic analyses of alfalfa.
Agron. J. 1959 : **51** : 470–72.

A method is described in which plants lacking one chromosome and designated trisomic tetraploids are used to identify genetic characters on individual chromosomes. Plants carrying marker genes are crossed with the trisomics; aberrant F_2 ratios indicate that a particular gene is associated with a specific trisomic. In this way the sticky leaf character has been found to be associated with a particular chromosome. This method can be used to determine which chromosomes show disomic inheritance and which show tetrasomic inheritance.

474 OOHARA [OHARA], H. & YOSHIDA, N.
(Studies on the cultivation and forage value of lucerne. II. The effect of inoculation with root-nodule fungi on the yield and forage value of lucerne).
Nihon Sochikenkyukai Shi/J. Jap. Soc. Herb. Crops Grassland Frm. 1959 : **4** : 108–19. [Japanese].

Extensive data are provided on plant height, forage yield, and content of protein, fat, fibre, ash, carotene and phosphate in seven American varieties, with and without inoculation, in Japanese trials during 1954–7.

475 RENFRO, B. L. & SPRAGUE, E. W.
Reaction of Medicago species to eight alfalfa pathogens.
Agron. J. 1959 : **51** : 481–83.

The three cultures of *M. arborea* investigated showed no symptoms of bacterial wilt (*Corynebacterium insidiosum*) and a culture of diploid *M. sativa* also showed a high level of resistance to this pathogen. *M. dzawkhetica* and *M. suffruticosa* were highly resistant to *Phoma herbarum* var. *medicaginis* in greenhouse and field tests and were quite resistant to bacterial wilt, common leaf spot (*Pseudopeziza medicaginis*), *Cercospora* and *Pseudoplea* leaf spots and to other pathogens involved in stem blackening. In the field tests stem blackening was caused mainly by *Phoma*, *Pseudoplea* and *Colletotrichum* in that order. The annual species tested had very little if any resistance to stem blackening.

476 Heinrichs, D. H.
Germination of alfalfa varieties in solutions of varying osmotic pressure and relationship to winter hardiness.
Canad. J. Pl. Sci. 1959 : **39** : 384–94.

The results from testing many varieties indicated that germination in sugar or salt solutions is not reliable as a method of differentiating varieties with respect to degree of winter hardiness.

477 Leach, C. M. & Hardison, J. R.
Susceptibility of alfalfa varieties to *Physoderma alfalfae*.
Plant Dis. Reptr. 1959 : **43** : 619–21.

Although all varieties of *Medicago sativa* tested for resistance to *Physoderma alfalfae* were found to be susceptible, differences were found in the severity of infection which were statistically significant. The most tolerant varieties were Talent, Socheville, du Puits, Sevelra, Vernal, Williamsburg, Cossack, Atlantic and Grimm.

478 Karchi, Z.
Study on the resistance in alfalfa to common leaf spot and on the relation of infection rating to plant color.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–1279 : p. 2424. (Abst.).

Two resistant and two susceptible clones were intercrossed and also used as tester parents. Selfing resulted in seed yields smaller than those obtained from crossing F_1 clones with each of the four testers. When nonparental testers were used to pollinate the F_1 clones, the seed yields were higher than those obtained with parental clones as male testers. Data on leaf-spot reaction fit a monohybrid tetrasomic model assuming chromosome segregation. According to this model, quadruplex, triplex and duplex genotypes result in resistance and simplex and nulliplex in susceptibility. Further studies are however necessary. There was no evidence of infection rating and colour intensity being inherently associated.

479 Pearson, L. C.
Predicting the performance of synthetic varieties of alfalfa from single cross data.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–1288 : p. 2425. (Abst.).

The performance of each of three synthetics was compared with the average performance of all the possible single crosses obtained from the parental clones. Synthetic performance was similar to average single cross performance in respect of bacterial wilt, *Pseudopeziza* leaf spot, *Pseudoplea* leaf spot, winter injury and persistence. However, significant differences were found between the behaviour of the synthetic variety and that of the single crosses in resistance to black stem, recovery after cutting and forage yield. It is suggested that in order to get a more reliable estimate of the performance of a synthetic, the decline in vigour due to loss of heterozygosity should be estimated for each clone used in the synthetic; this could be done by studying S_1 progeny of each parental clone. The progeny of 15 single crosses were scored for *Pseudopeziza* leaf spot and a factorial analysis was attempted. The data fit a monohybrid tetrasomic model assuming maximum equational segregation; according to the model, quadruplex, triplex and duplex genotypes result in resistance, the simplex in an intermediate reaction and the nulliplex in complete susceptibility. This model is only a tentative suggestion for there were no F_3 or back-cross data available for testing genotypes.

480 Goplen, B. P. & Stanford, E. H.
Studies on the nature of resistance in alfalfa to two species of root-knot nematodes.
Agron. J. 1959 : **51** : 486–88.

Meloidogyne hapla completely failed to penetrate roots of the resistant plants which were selfed progeny of selection M4 of Vernal. No structural differences were found between root tips of resistant and susceptible plants. Larvae of *M. javanica javanica* did enter resistant progeny of another Vernal selection but were not able to reproduce. Grafting experiments with roots showed that resistance to *M. hapla* is an inherent property of the root.

481 Stanford, E. H. & McMurtry, J. A.
Indications of biotypes of the spotted alfalfa aphid.
Agron. J. 1959 : **51** : 430–31.

A biotype of *Therioaphis maculata* capable of causing break down of the intermediate type of resistance shown by some plants of the synthetic lucerne variety Lahontan and by one of its five constituent clones (C–901) [cf. XXVIII, 603] has been found. No evidence has however been obtained that the reaction of the highly resistant proportion of plants in the variety and of one of its highly resistant constituent clones (C–84) is affected.

482 **Aphid-resistant alfalfa.**
Agric. Res., Wash. 1959 : **8** : No. **1** : p. 15.

Adapted to the central plains of the USA, Cody possesses the antibiotic and tolerant types of resistance to spotted aphid (*Therioaphis maculata*). The variety is a synthetic developed from selections of Buffalo. Even in aphid-free areas, Cody has equalled Buffalo in yield.

483 Stammeforsøg med rødkløver 1953–1957. (**Strain trials of red clover, 1953–1957**).
Tidsskr. Planteavl 1959 : **63** : 351–54.

[Cf. XXVIII, 4332].

484 Kazimierski, T.
Niektóre zagadnienia związane z gospodarką wodną di- i tetraploidalnych form koniczyny czerwonej i seradeli. (**Some problems connected with the water economy of diploid and tetraploid forms of red clover and serradella**).
Roczn. Nauk rol. : Ser. A 1958 : **79** : 563–72.

Compared with tetraploids, diploids of the above species transpired more per unit surface area of leaf, both in the field and the laboratory, and had smaller leaves, a smaller total leaf area, and fewer stomata per leaf and per unit area of leaf. Leaves of tetraploid plants had a higher water content but did not differ from diploids in the rate of movement of water in the petioles.

485 Łączyńska-Hulewiczowa, T.
Badania nad samopłodnością koniczyny czerwonej di- i tetraploidalnej. (**Studies on self fertility in diploid and tetraploid red clover**).
Roczn. Nauk rol. : Ser. A 1958 : **79** : 151–60.

Free self-pollination of isolated plants gave very low pod sets in both diploids and tetraploids. Improved sets were obtained with artificial selfing, the improvements being much more marked in the tetraploid than in the diploid and being greater when pollen from another floret in the same head or from another head on the same plant was used rather than pollen from the same floret. These observations suggest that plasmatic as well as genetical factors affect self fertility.

486 Povilaitis, B. & Boyes, J. W.
Embryo-sac production in relation to seed yields of diploid Dollard red clover.
Canad. J. Pl. Sci. 1959 : **39** : 364–74.

Evidence has been obtained indicating that (1) the amount of ovary sterility caused in Dollard by failure of the embryo sac to complete its development is under genetic control and influenced by environmental conditions, and (2) ovary sterility is an important factor limiting seed production.

487 Kress, H. & Fuchs, A.
Über den Züchtungswert von Rotkleeformen mit kurzer Blütenröhre. (**The breeding value of forms of red clover with short corolla tubes**).
Z. Pflanzenz. 1959 : **41** : 167–94.

Amongst the many plants investigated at Gülzow-Güstrow, variation in the length of the corolla tube was found and in some plants this was as short as the proboscis of the honey bee. This short corolla tube is an inherited character and by breeding between selected short-tubed plants it was possible to effect a marked increase in the frequency of short-tubed forms. Inbreeding depression also occurred; the progenies became less vigorous as more and more short-tubed forms appeared, those with the shortest tubes being more or less sterile. Also, short-tubed plants produced fewer flower heads and less seed than the long-tubed forms. Of the short-tubed forms, those with light-coloured flowers gave the lowest seed yield. It appears that selecting red clover plants particularly suited to pollination by bees does not increase the seed yield.

488 Kazimierski, T.
Przekształcanie się zalążni w liście u tetraploidalnych form koniczyny białej (*Trifolium repens* L.) i koniczyny szwedzkiej (*Trifolium hybridum* L.). [**Transformation of the ovary into leaves in tetraploid forms of white clover (*T. repens* L.) and Alsike clover (*T. hybridum* L.)**].
Roczn. Nauk rol. : Ser. A 1958 : **79** : 161–72.

This is the Polish version of a paper already abstracted [cf. XXVIII, 4342].

489 LEHLE, H.
Ein Beitrag zur Kenntnis der Ertragsmerkmale des Weissklees und ihrer Bedeutung für die Züchtung. (**A contribution to knowledge of the yield characters of white clover and their importance for breeding**).
Z. Acker- u. PflBau. 1959 : **108** : 384–412.

White clover strains from the breeding stock of the Hohenheim Institute and from grasslands in south-western Germany were studied and marked differences in the yield and the chemical composition of the crop were found. A white-clover crop consists almost entirely of leaves and their size and number therefore largely determine the yield. In 1955 the yield of dry matter in two cuttings from individual plants varied between 242 g. for the larger-leaved forms and 16 g. for the small-leaved forms. Leaf size and stalk length are correlated and there is also a correlation between leaf weight and stalk weight. The yield from the large-leaved forms therefore has a greater proportion of stalk than is found in the yield of small-leaved forms. Also when the crops are cut at the same level there is a relatively greater loss of stalk from the small-leaved crops. Strains with very small leaves are below the level of the sickle at the second cut. The dry-matter content of the leaf blade is 7·2 to 8·6% higher than that of the leaf stalk and the crude protein content of the blade is 14·2 to 16·7% higher; therefore the yield from smaller-leaved types contains relatively more crude protein and dry matter than that of the larger forms.

Observations were made on changes in leaf size occurring during growth and it was found that the relative differences in leaf size between strains were maintained throughout the vegetative period. The small-leaved strains came from regions where conditions were unfavourable and the large-leaved strains from good meadows and pasture, where selection for large leaf-size has occurred. The wild strains were on the whole inferior to those of the Hohenheim Institute.

490 MACKIEWICZ, H.
Badania nad di- i tetraploidalną koniczyną szwedzką (*Trifolium hybridum* L.). [**Studies on diploid and tetraploid Alsike clover (*T. hybridum* L.)**].
Roczn. Nauk rol. : Ser. A 1958 : **79** : 677–88.

Tetraploids exceeded diploids in size of most plant parts but had fewer internodes per stem and fewer inflorescences per plant. Pollen grains were larger and the percentage of bad pollen higher in the tetraploids. Open pollination gave a higher seed set in the diploids than in the tetraploids while various types of selfing did not.

491 WATANABE, K., SHIMANO, I. & YAMADA, T.
(**A varietal trial of subterranean clover of Australian provenance**).
Nihon Sochikenkyukai Shi/J. Jap. Soc. Herb. Crops Grassland Frm. 1959 : **4** : 140–47. [Japanese].

Data are provided on the plant and seed yield of 5 Australian varieties under trial in Japan.

492 PICARD, J.
Quelques résultats concernant l'amélioration du trèfle incarnat. (**Some results concerning the breeding of crimson clover**).
Ann. Inst. nat. Rech. agron., Paris : Ser. B 1959 : **9** : 319–31.

Crimson clover is a self-fertile plant but under natural conditions cross pollination occurs to a considerable extent. It is easy to obtain inbred lines with a high level of homozygosity. A breeding procedure is suggested which involves selecting vigorous inbred lines resistant to diseases and cold and testing these for specific combining ability; the two best lines are multiplied and then grown as a mixed crop and the second generation of the hybrid is used commercially.

493 ADACHI, A. & SUZUKI, S.
(**On handling hard seeds in connexion with lespedeza breeding**).
Nihon Sochikenkyukai Shi/J. Jap. Soc. Herb. Crops Grassland Fm. 1958 : **3** : 79–82. [Japanese].

After three years' continuous selection of *Lespedeza stipulacea* 'Climax', two strains, one with permeable and one with impermeable seeds, were obtained. It is reported that the former germinates and is killed by winter cold if sown in the autumn.

494 KITA, F., MAGOON, M. L. & COOPER, D. C.
Simple smear techniques for the study of chromosomes of *Melilotus*.
Phyton, Vicente López 1959 : **12** : 35–38.

The following procedure is recommended for studying mitotic chromosomes: pretreatment of root tips with 0·01% colchicine solution for 1 hr.; washing with water; fixation in a 7 : 1 : 1 : 1 mixture of 75% alcohol, chloroform, formalin and acetic acid for 8–10 min.; washing with 1 N HCl; hydrolysis with warm 1 N HCl at 60° C. for 6–7 min.; treatment with leucobasic fuchsin for 15–18 min.; and squashing after a quick rinse in 45% acetic acid. For meiosis, the technique recommended is fixation of anthers in 3 parts of absolute alcohol and 1 part of propionic acid saturated with ferric acetate at 0–4° C. for 24 hr.; and smearing in propionocarmine (1 g./100 ml. boiling propionic acid).

495 Šubin, M. M.
(The importance of sweet clover to agriculture in the steppe districts of the Altaj territory).
Zemledelie (Agriculture) 1958 : No. 11 : 62–66. [Russian].

The value of sweet clover as forage and as a crop for improving poor saline soils is discussed. Mention is made of the recent varieties Ljucernovidnyj 9654 [Lucerne-type 9654] and Malokumarinovyj 909 [Low-coumarin 909] bred at the Institute of Plant Industry. Both have a low coumarin content.

496 Jaranowski, J.
Próba zbliżenia wegetatywnego łubinu białego (*L. albus*) i łubinu żółtego (*L. luteus*) dla umozliwienia krzyżowania generatywnego tych gatunków. **[An experiment on vegetative rapprochement of white lupin (*Lupinus albus*) and yellow lupin (*L. luteus*) to make sexual crossing of these species possible].**
Roczn. Nauk rol. : Ser. A 1958 : **79** : 239–53.

This is the Polish version of a paper already abstracted [cf. XXVIII, 4356].

497 Mihal'čuk, A. L.
(A conference on the questions of coordination and improvement of scientific research, production and utilization of the lupin in agriculture).
Zemledelie (Agriculture) 1958 : No. 10 : 88–91. [Russian].

This report on a recent conference in the Ukraine mentions the following new high-yielding varieties of sweet lupin: Nosovskij Belosemjannyj [Nosovo White-seeded], White Russian 6, Belorusskij Kormovoj [White Russian Fodder] and Gardenjaj.

498 Mackiewicz, H.
Żywotność pyłku u trzech gatunków łubinu. **(Pollen viability in three lupin species).**
Roczn. Nauk rol. : Ser. A 1958 : **79** : 103–38.

Percentage germination, tube length and viability of the pollen were studied in the upper, middle and lower parts of the main and lateral inflorescences of varieties of *Lupinus albus*, *L. luteus* and *L. angustifolius*. The three pollen characteristics were best developed in *L. angustifolius* 'Obornicki' and *L. luteus* 'Oleski' and least in *L. albus* 'Przebędowski'. Intraspecific differences were more highly significant than interspecific, early varieties with low alkaloid content having the poorest pollen. Pollen from the lower part of the inflorescences generally had greater viability and longer pollen tubes than that from the upper but showed no difference in germination. Both pollen and ovules of the upper parts of the inflorescences were fertile and could not be regarded as causes of the lack of pod formation usually observed in this position.

Probleme der Bewirtschaftung von Sandböden. Vorträge der wissenschaftlichen Arbeitstagung am 26. und 27. September 1957 im Institut für Acker- und Pflanzenbau Müncheberg der Deutschen Akademie der Landwirtschaftswissenschaften zu Berlin. **(Problems of the management of sandy soils. Papers of the Scientific Work Session on 26 and 27 September 1957 in the Müncheberg Institute for Agriculture and Plant Cultivation of the German Academy of Agricultural Sciences in Berlin)**: 1958.

499 *Hackbarth, J. Die gelbe Lupine als Sandpflanze im Weltmassstab und ihre Bedeutung als Futterpflanze des Sandbodens. (The yellow lupin as a sand plant on a world scale and its importance as a fodder plant for sandy soil).*
(pp. 87–95).

This review includes an historical account of the production of sweet strains of *Lupinus luteus*; the gradual extension of their cultivation in countries outside Germany is traced and an outline is given of the breeding work that is at present in progress in different countries of the world with the aim of producing locally adapted strains of sweet yellow lupin.

500 Nowacki, E.
Łubin zmienny — *Lupinus mutabilis* Sweet. Morfologia i fizjologia gatunku. **(*L. mutabilis* Sweet. Morphology and physiology of the species).**
Roczn. Nauk rol. : Ser. A 1958 : **79** : 173–85.

Data on shattering, rate of growth, growth period and contents of protein, fat and alkaloids in the seeds are given for *L. mutabilis*. Large-seeded plants were generally free from shattering. Protein and fat contents were high and alkaloid relatively low. *L. mutabilis* x *L. ornatus* is regarded as showing promise in breeding fodder plants.

501 D'OLIVEIRA, B.
The life cycle and physiologic specialization of *Uromyces renovatus* Syd.
Agron. lusit. 1955 : **17** : 215–29.

The above species has been shown to be heterothallic. Eleven physiological races (A–K) have been differentiated in a collection of 74 Portuguese samples by their effects on the differential hosts *Lupinus albus*, *L. angustifolius*, *L. digitatus*, *L. hirsutus*, *L. luteus* and *L. rothmaleri*. *U. renovatus* appears to be closely related to the North American species *U. occidentalis* in which the alternate host is also a member of the Euphorbiaceae.

502 DONOVAN, L. S.
The inheritance of leaf size in broad-leaf birdsfoot trefoil, *Lotus corniculatus* L.
Canad. J. Pl. Sci. 1959 : **39** : 141–57.

The inheritance of leaf size was studied in crosses involving the large-leafed (*L. corniculatus* var. *vulgaris*) and the small-leafed (*L. corniculatus* var. *arvensis*) forms. The genetics of this character appears to be relatively simple and mainly under the control of alleles at one locus. These alleles show no dominance and there is evidence that the allelic interaction is geometric in nature. Back-cross ratios of 1 : 4 : 1 and 1 : 2 : 2 : 1 were obtained which are indicative of autotetraploid segregation with the chromosomes pairing at random. However a complete explanation for these ratios cannot be given.
Observations made at meiosis on the parent plants revealed a low frequency of quadrivalent formation, univalents and trivalents, most chromosomes pairing as bivalents. This suggests that if this species is of autoploid origin, the process of transformation to the diploid type of chromosome behaviour is fairly complete, and therefore disomic, tetrasomic and disomic-tetrasomic ratios can be expected.

503 BENT, F. C.
Investigations in interspecific hybridization and fertility of certain *Lotus* species.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–116 : p. 2207. (Abst.).

Fertility relationships were investigated within and between the following: *L. tenuis* ($2n = 12$), induced autotetraploid *L. tenuis*, diploid *L. uliginosus* ($2n = 12$), induced autotetraploid *L. uliginosus*, natural tetraploid *L. corniculatus* ($2n = 24$) and natural diploid *L. corniculatus* var. *japonicus* ($2n = 12$). The droplet method of colchicine application was suitable for inducing polyploids, which could be identified by stoma length and number and pollen-grain shape. Chromosome counts were made to check the identification. Earlier reports of self compatibility in *L. uliginosus* and *L. corniculatus* var. *japonicus* were confirmed. Compatibility reactions within *L. tenuis* could not be satisfactorily explained on the basis of an *S*-allelic system. Variations in morphological features and the HCN test were useful in detecting hybrids. Three new interspecific crosses, (1) *L. uliginosus* ($2n$) x *L. tenuis* ($2n$), (2) *L. uliginosus* ($2n$) x *L. corniculatus* and (3) *L. uliginosus* ($4n$) x *L. corniculatus*, were effected with the aid of embryo culture. One sterile hybrid was obtained from (1). Two triploids ($2n = 18$) were raised from (2), one of which was normal in growth and the other greatly retarded. The normal hybrid was self incompatible and failed to cross with either parent but was compatible with some of the seven hybrids ($2n = 24$) derived from (3). Six of the last-mentioned were normal in growth while the seventh was considerably retarded. One of the five hybrids tested was self compatible, ♂ sterile and ♀ fertile, one was self incompatible, ♂ sterile and ♀ fertile, while the remaining three were self incompatible, ♂ fertile and ♀ sterile.

504 HART, R. H. & WILSIE, C. P.
Inheritance of a flower character, brown keel tip, in *Lotus corniculatus* L.
Agron. J. 1959 : **51** : 379–80.

A detailed account is given of an investigation, the results of which have already been summarized [XXIX, 189].

ROOTS AND TUBERS

505 HOSODA, T. & SUZUKI, Z.
(The application of grafting to obtain synthetic *Brassica napus*).
Nihon Sochikenkyukai Shi/J. Jap. Soc. Herb. Crops Grassland Frm. 1959 : **4** : 136–40. [Japanese].

By grafting a number of turnip varieties on cabbage varieties and pollinating with cabbage, an increase in number of fruits set over the controls was obtained. No seeds were obtained from pollinating the turnip scions with cabbage but on selfing an F_1 generation was obtained in which variation in leaf morphology was observed. On pollinating the F_1 plants with cabbage pollen, fruit set was again higher than in the controls; self fertility was also higher. However, no seed resulted from interspecific pollination.

506 SARASHIMA, M., MORIYA, A. & HOSODA, T.
(The improvement of Cruciferous forage root crops. I. The production of F_1 hybrids).
Nihon Sochikenkyukai Shi/J. Jap. Soc. Herb. Crops Grassland Fm. 1958 : **3** : 102–05. [Japanese].

Descriptions are given of interspecific hybrids involving turnips, swedes, rape, *Brassica chinensis* and *B. campestris* raised in Tochigi prefecture, special attention being paid to root development. Swede and rape were used as mother plants. The F_1 plants were more vigorous than the mother plants but whereas all the offspring from swede mother plants produced swollen roots, irrespective of the pollinator, none of the progeny from rape mother plants did so.

507. JÄHNL, G.
Ergebnisse der Kartoffelversuche des Jahres 1958. **(Results of the potato trials of the year 1958).**
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1959 : No. 47 : Pp. 68.

The results are reported of trials held in different parts of Austria with many potatoes of different maturity groups.

508 MIRANDA DE ONÍS, J., PRIETO HERAUD, E. & BERNALDO DE QUIRÓS, A. G.
Ensayos comparativos de variedades de patata. **(Comparative trials of potato varieties).**
An. Inst. nac. Invest. agron., Madr. 1958 : **7** : 1059–120.

Of 52 potatoes tested in eight areas in Spain in 1955, Olalla was the best short-cycle variety, coming first in six trials. Among the long-cycle varieties, Arana 56, Agnes, Alava, Goya and Voran yielded well.

509 LETNES, A.
Sortsforsøk med fabrikkpoteter. **(Trials of industrial potato varieties).**
Forskn. Fors. Landbr. 1959 : **10** : 229–49.

The results of trials conducted in various parts of Norway during 1952–57 are presented, together with notes on the chief characters of some of the varieties.

510 JENSEN, J.
Forsøg med tidlige brokimmune sorter af spisekartofler 1955–57. **(Trials of early, wart-immune varieties of table potatoes, 1955–57).**
Tidsskr. Planteavl 1959 : **63** : 61–76.

Data on the yield, dry-matter content, ascorbic acid content, flavour and cooking quality of seven varieties lifted at three different dates are given, and each variety is described in detail. Tylstrup 48347 gave the highest yield at each lifting.

511 **Progress report of the scientific work of the Central Potato Research Institute, India, for the period from August 1949 to March 1956.**
1957 : Pp. 48.

A report is included of breeding at the main station at Patna and substations at Simla, Kufri and Bhowali, since the establishment of the Potato Institute in 1949. A collection of indigenous and foreign commercial varieties, wild and cultivated tuber-bearing species and introduced interspecific hybrids is maintained at Simla. Several of the foreign commercial varieties have been used in intervarietal crosses. Use has also been made of *Solanum antipoviczii*, *S. demissum*, *S. curtilobum* and other species in hybridization.

F_1 seedlings from intervarietal crosses have been subjected to a graded system of rigorous selection during successive seasons, only those hybrids with a high degree of field resistance to viruses and consistently high yield being retained. Inbreeding has also been undertaken, coupled with the same system of testing as that applied to the hybrids. Breeding for yield has resulted in improved varieties for early and main plantings in the plains of northern India and for the hills while the good performance of two varieties at Koilpatti, Madras, is encouraging from the point of view of extending potato cultivation to the plains of southern India, the crop in this part of the subcontinent being at present confined to the hills.

In breeding for late-blight resistance, progress has been made in developing a few field-resistant strains, using as parents resistant commercial varieties and *S. demissum*. Now that material of differential hosts has been received from the Scottish Plant Breeding Station, work on the identification of races of the pathogen will shortly be initiated in connexion with the testing of hybrid progenies for reactions to individual races. Breeding for resistance to viruses X and Y is under way. Some seedlings from crosses in which the USDA41956 figured as X-immune parent were selected for further study on the basis of their satisfactory reaction to sap inoculation with X. Only Katahdin has so far been used as a Y-resistant parent. When tested by sap inoculation and aphid transmission, a few of its hybrid seedlings showed some degree of resistance to virus Y.

Inbred selections of *S. chacoense* displayed promise in the southern plains, on account of their resistance to heat and also to charcoal rot (*Macrophomina phaseoli*), a serious storage disease in these plains. A few of the selections were free from the bitter taste found in cooked samples of most of the selections and caused by solanin. In view of the long stolons and deep-eyed tubers produced by this species, it was crossed with the Indian variety Phulwa. The progeny was however very poor in growth and yield. Tetraploids of *S. chacoense* were obtained by colchicine treatment. Crosses between $4n$ *S. chacoense* and *S. tuberosum* were only successful with the former as ♀ parent. The seedlings are to be studied for their charcoal-rot resistance and suitability for growing under high temperatures.

Data on self and cross incompatibility in *S. rybinii* are interpreted on the basis of an oppositional allelic system. Evidence was obtained that in *S. aracc-papa* an inhibitory factor modified crossabilities.

A white-skinned mutant of the hybrid selection ON295, which normally has purple-splashed tubers, was isolated at Patna. Equal in yield to the parent variety, the mutant is expected to replace Phulwa as a late cropper. Another mutant with uniform red skin was also isolated from ON295.

Since raising the crop from true seed would have a number of advantages, Phulwa is being subjected to inbreeding in order to explore the possibilities of using homozygous lines for this purpose and for the production of F_1 hybrids.

Abstracts of papers presented at the Forty-third Annual Meeting of the Potato Association of America held at University of New Brunswick, Fredericton, New Brunswick, August 12, 13, 14, 15, 16, 1959.
Amer. Potato J. 1959 : **36** : 292–305.

512 *Bagnall, R. H. & Young, D. A. Inheritance of immunity to virus S in the potato.* (*p. 292*).

The virus-X immune variety Saco is also highly resistant or immune to virus S. Seedlings from crosses in which Saco figured as one parent and from selfed Saco were tested for S immunity. Crosses of Saco with unrelated seedlings, susceptible to both S and X, did not yield any S-immune seedlings. When the other parent was, like Saco, an X-immune derivative of seeding 41956, the progenies contained a small percentage of S-immune seedlings. The proportion of S-immune seedlings from selfed Saco was considerably higher. Although S and X immunity appeared to be derived, in part at least, from seedling 41956, no correlation was found between S and X immunity among the progenies.

513 *Bienz, D. R. A comparison of pollen behavior and pollen-tube growth in styles of potato flowers grown on cuttings with those of flowers remaining on the plant.* (*p. 292*).

In certain crosses use of pollen from ♂-fertile clones on stigmas of ♀-fertile clones failed to lead to fruit formation. These crosses set fruit if cuttings from the ♀ parents were placed in a nutrient mineral solution before the flower buds opened. In cuttings thus treated, more pollen grains remained on the stigmas and the percentage of pollen germination and rate of tube growth were greater.

514 *Hooker, W. J. & Kim, W. S. Inhibitors of potato virus X in leaves of potatoes with different types of resistance to the virus.* (*pp. 295–96*).

The leaf juices of varieties tolerant, hypersensitive and immune to virus X were similar in their inhibitory effect on this virus.

515 *Hougas, R. W. & Peloquin, S. J. Hybrids of* Solanum tuberosum *haploids and the tuber-bearing* Solanum *species.* (*p. 296*).

Hybrids have been produced from crosses of *S. tuberosum* haploids ($2n = 24$) with 23 tuber-bearing diploid species belonging to the series *Tuberosa, Demissa, Commersoniana, Cuneolata* and *Megistacroloba*. Most of the F_1 plants were vigorous. F_2 and BC_1 populations of five of the combinations have been raised. Cherokee, Early Gem, Katahdin, Kennebec and Merrimack have been crossed with *S. tuberosum* haploids. Seed set from such matings has been very low. Triploid and tetraploid F_1 hybrids from these crosses are vigorous.

516 *Kehr, A. E. & Horton, J. C. Resistance to infection by mechanical inoculation with virus X in potato.* (*pp. 296–97*).

Seedlings from the cross between X-susceptible X927–3 ♀ x X-susceptible B2903–17 ♂ possessed resistance to this virus, when infected by mechanical inoculation. Preliminary evidence indicated that the immunity was closely similar to, or identical with, the X immunity shown by S41956. Examination of the pedigrees of the parental lines and of S41956 revealed several similarities but no common source of resistance. This is the first report of X resistance in the progeny of a cross between two susceptible parents. The authors favour the hypothesis of complementary genes as the mode of inheritance of X resistance.

517 *Larson, R. H. & Oshima, N. Potato virus S recovered from the roots of the "immune" variety Saco.* (*p. 299*).

Upon top-graft inoculation, virus S passed through the stem tissues of Saco and multiplied in the roots of this otherwise immune variety.

518 *Niederhauser, J. S., Buck, R. W. & Akeley, R. V. Erendira, a new blight-resistant potato variety for the highlands of central Mexico.* (*p. 300*).

[Cf. XXIX 2821].

519 *Niederhauser, J. S. & Cervantes, J. Anita, Bertita and Conchita, three new blight-resistant potato varieties developed in central Mexico.* (*p. 301*).

Anita, Bertita and Conchita were developed by the Mexican Department of Agriculture for cultivation in the rainy season in central Mexico. As the result of their multigenic resistance to late blight, they give high yields when not sprayed. Conchita and Bertita are medium in maturity while Anita is very late. Anita was derived from USDA Ac. 25953 x USDA B2131–3. The other two varieties have the same parentage, USDA Ac. 25953 x USDA Ac. 25959. The two last-mentioned parents have *S. demissum, S. andigenum* and *S. tuberosum* in their pedigrees.

520 *O'Keefe, R. B. Factors affecting and methods of testing potato varieties* (Solanum tuberosum, L.) *for heat and drouth resistance.* (*pp. 301–02*).

Under field conditions differences in root development among nine varieties were apparently slight, as indicated by the "consistency of time and rate of water extraction to soil depth of six feet independently of variety." Intervarietal differences in production efficiency, defined as "bushels per acre per inch of water" were nonsignificant. In heat-machine tests (132–134° F.) of 45 varieties, 12 distinct types of wilting curves were obtained. Permanent damage to the plant and degree of wilting were correlated. Inherent time of maturity had little effect on varietal response to heat and thus on permanent plant damage. Degree of wilting was correlated with plant height and coefficient of leaf area (number of leaves x number of leaflets). The 45 varieties were also studied with respect to water losses from excised leaves and stems and from intact plants. Volume of water lost per unit of leaf area was correlated with the coefficient of leaf area. Degree of wilting in heat-machine tests was correlated with this coefficient. Wilting was not however correlated with total loss of water from the leaves. The desiccating effect of heat and heat-induced drought was therefore concluded to be dependent on the volume of water lost per unit area of leaf rather than the total loss of water from the leaves. [Cf. XXIX, 1695a].

521 *Peloquin, S. J. & Hougas, R. W. Haploidy in* Solanum tuberosum *and in the subspecies* andigena. (*p. 302*).

Sixteen varieties and several breeding stocks of the cultivated potato were used as females in interspecific matings with 30 pollinators in attempts to induce haploids. The combined use of suitable genetic markers and decapitation of the ♀ parents substantially increased efficiency in the detection of haploidy. One hundred and seventy-four haploids were obtained, representing 12 varieties and 5 breeding stocks. Haploid frequency per 100 pollinations ranged from 0 to 9 and was affected by both the *S. tuberosum* parent and the pollinator. In the induction of haploids of ssp. *andigenum*, 28 were secured from 700 interspecific pollinations.

522 *Plaisted, R. L. A technique for evaluating the ability of selections to yield consistently in different locations or seasons.* (*p. 302*).

"The technique is to compute a combined analysis of variance of all n varieties over all locations. If the variety x location interaction is significant, then a similar type of combined analysis is computed for each of the $\frac{1}{2}n$ $(n-1)$ combinations of pairs of varieties over all locations. From these a component of variance, sigma VL^2, can be estimated for each pair of varieties. Next the arithmetic mean is obtained of the $n-1$ estimates involving one line in common. This then gives a figure which is defined as the relative contribution of that variety to the overall variety x location interaction component of variance.

The value of this technique can be assessed only as its results are borne out by the experience of growers with established varieties. Application of this technique to past yield trials in New York State showed that Green Mountain quite regularly had a high relative contribution to the interaction component while Katahdin and Cobbler had a low relative contribution. These results are in accord with experience with these varieties."

523 *Rieman, G. H., Cooper, D. C. & Tseng, P. M. Appearance and detection of diploid plants (2x = 24) in seedling populations of* Solanum tuberosum. *(pp. 302–03).*

About 100 small plants, ½ in. in height at transplanting time, were selected from 4900 seedlings averaging about 2 in. in height. Four of these selected plants produced mature leaves with twice as many stomata per given area as the $2n = 48$ controls. Their stomata had a mean size about half that of the controls. Cytological examination confirmed that the four plants had $2n = 24$. Two of the four haploid clones flower readily, producing 25–40% stainable pollen and functional ♀ and ♂ gametophytes. Further haploids of *S. tuberosum* are being isolated from normal breeding stocks by examining the stomata of the cotyledonary leaves of seedlings grown from seeds belonging to the smaller sieve sizes in lots containing 1000–10,000 seeds.

524 *Thompson, N. R. Induced seed formation without pollination in* Solanum tuberosum *L. (p. 305).*

Flowers of plants from which the style had been removed produced fruits when sprayed with 2-methyl-4-chlorophenoxyacetic acid at concentrations of 0·003 to 0·006%. Viable seeds found in a few of the fruits gave rise to plants with $2n = 24$.

525 *Werner, H. O. Chip quality and darkening during drying with slices of raw dry potatoes as influenced by variety, place and storage. (p. 305).*

A significant correlation coefficient of $r = 0{\cdot}37$ has been obtained between numerical estimates of crisp colour, made by aligning samples in a gradient series, and "Rd readings with a color comparator." Attention is being given in breeding to differences in the darkening of slices of raw dry potatoes, because of the significance of this condition in prepeeling and processing. "Between tuber specific gravity and chip color, and to a lesser extent with graying of raw potatoes, there has been a high correlation within varieties, culture and places, the latter to least extent. Maturity, aside from its influence on specific gravity and post harvest storage have also been very important. A low but highly significant correlation was found to occur between chip color and raw tuber graying."

526 Magoon, M. L. & Cooper, D. C.
Crossability among Mexican tetraploid *Solanum* species.
Phyton, Vicente López 1959 : **12** : 39–41.

Good seed set was obtained from the following crosses: *S. polytrichon* x *S. fendleri*, *S. polytrichon* x *S. stoloniferum*, *S. fendleri* x *S. stoloniferum*, *S. fendleri* x *S. papita* and *S. papita* x *S. polytrichon*. Most of the seeds germinated and produced vigorous plants ($2n = 48$). Selfing and sib mating resulted in a fairly good set of seed in all the combinations. *S. polytrichon* x *S. tuberosum* and the reciprocal cross failed. Attention is drawn to the possible value of the hybrids to the breeder.

527 Höppner, E.
Die zur Anerkennung 1959 zugelassenen Kartoffelsorten. (**The potato varieties approved for 1959**).
Kartoffelbau 1959 : **10** : 124–25.

Information is provided on the leaf and flower characters by which 31 varieties of potato may be recognized. Also additional morphological details of seven varieties, Laverta, Poet, Anka, Arensa, Brava, Cosima and Antje, recently added to the official list in Federal Germany are tabulated.

528 Toniolo, L. & De Poli, E.
La patata: caratteri diagnostici e descrizione di alcune varietà. (**The potato: diagnostic characters and description of some varieties**).
Progr. agric., Bologna 1959 : **5** : 565–92.

Characters of tuber, sprouts grown in the dark and in light, haulm, leaves, flowers and tuber that can be used in varietal identification are analysed and descriptions are given of 12 varieties commonly cultivated in Italy.

529 **Issue on varieties 1959.**
Potato News Netherlands 1959 : **8** : No. 3 : 1–28.

Descriptions of 60 varieties are presented, together with information on parentage, performance under Netherlands conditions and the names of the breeders and suppliers.

530 Peterson, C. E. & Hooker, W. J.
Tawa: a new early potato variety resistant to late blight, scab, and immune to latent mosaic.
Amer. Potato J. 1959 : **36** : 267–74.

Released in 1956 by the US Department of Agriculture in cooperation with the Iowa and

Michigan Agricultural Experiment Stations, Tawa combines resistance to late blight and scab with virus-X immunity of the type shown by S41956. It has also shown immunity from virus A. Early in maturity, Tawa produces smooth attractive tubers with good cooking and crisp-making quality. Earlaine, Richter's Jubel, Cherokee and several USDA seedlings, including S41956, entered into its parentage.

531 ESTRADA RAMOS, N., PÉREZ MONTENEGRO, E. & HEIDRICK, L.
Diacol Monserrate, una nueva variedad de papa. (**Diacol Monserrate, a new potato variety**).
DIA Bogotá 1959 : No. 6 : 9–20.

The line 50–57–67 [cf. XXIX, 1304], from Branca Cascuda [Thick-skinned White] and Pana Blanca [White Plush], has been named Diacol Monserrate. Its merits include field resistance to blight and, compared with the commonly grown local varieties in Colombia, 30% higher yield, greater earliness and greater uniformity in growth and tuber size.

532 REZNIK, K.
(**High potato yields**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 12 : 37–38. [Russian].

Among the exhibits at the Moscow Agricultural Exhibition were 72 new high-yielding late varieties, including Barhatnyj [Velvet], Vystavočnyj [Exhibition], Trojanda and Katjuša, all of which are characterized by good flavour and the last two by resistance to wart.

533 LEBEDEWA [LEBEDEVA], N. A.
Das durch Polyploidie ausgelöste Varieren der Eigenschaften und Merkmale der Kartoffel. (**The variation in properties and characters of the potato caused by polyploidy**).
Züchter 1959 : **29** : 107–17.

Details are provided of morphological variation in polyploids of *Solanum punae*, *S. schreiteri*, *S. schickii*, *S. parodii*, *S. horovitzii*, *S. gibberulosum*, *S. polyadenium*, *S. antipoviczii* vars. *gandarae* and *reddickii*, *S. verrucosum*, *S. demissum*, *S. macolae*, *S. kesselbrenneri*, *S. phureja*, *S. tuberosum* vars. *multibaccatum* and *pachaconja* and cultivated varieties of *S. tuberosum*. In most cases the polyploids were found to be larger and more vigorous than the corresponding diploids. Polyploids of the heterozygous species *S. gibberulosum* and *S. kesselbrenneri* showed a very wide range of variation which in many cases exceeded the range of the species. Two forms of *S. gibberulosum* with 96 chromosomes were obtained; one was very vigorous and 80 cm. tall and the other was very short. Chromosome doubling by means of colchicine treatment was more difficult to effect in *S. tuberosum* than in the other species; the colchicine-treated seedlings did not differ from normal tetraploids in height and vigour but had rather thicker leaves, wide leaflets and larger flowers. All the octoploids of *S. tuberosum* were self sterile. Polyploids such as those of *S. punae*, *S. schreiteri*, *S. demissum*, and *S. antipoviczii* were slightly fertile in the first year after chromosome doubling. In subsequent years an improvement in fertility was observed in polyploids of *S. punae* and *S. gibberulosum*.

The yield of tubers from the polyploids of wild species was significantly higher than that of the original forms. One polyploid of *S. gibberulosum* ($2n = 96$) gave a yield 25 times greater than that of the diploid. Polyploids of bred varieties of *S. tuberosum* did not surpass the diploids in yield.

Polyploids and normal plants of *S. schreiteri*, *S. punae*, *S. demissum* var. *atrocyaneum* and *S. demissum* 'Reddick 521' were tested for frost resistance. Whereas *S. punae* ($2n = 96$) could withstand −7 to −8° C., the polyploid form ($2n = 96$) withstood −8 to −9° C. The other species were less resistant. Flecks of *Phytophthora* were observed on *S. demissum* var. *atrocyaneum* and *S. demissum* 'Reddick 521' ($2n = 72$) in the field but the symptoms were not so marked on the polyploids ($2n = 144$). Tetraploids and octoploids of *S. antipoviczii* vars. *gandarae* and *reddickii* showed no signs of *Phytophthora*. Diploids and tetraploids of *S. polyadenium* were artificially infected with aggressive races of *Phytophthora* but they were not attacked; in a particularly damp summer the diploid *S. polyadenium* showed some flecks but the tetraploid remained completely resistant. Gontürov has found that polyploids of *S. gibberulosum* are more resistant to *Epilachne* than the diploids.

Variation in the starch and protein contents of the tubers after polyploidization has also been investigated. In the polyploids an increase in tuber yield was linked with a decrease in starch content, an exception being *S. kesselbrenneri*, in which starch content increased with yield of tubers. The protein content of the polyploid tubers either remained unchanged or showed a rise; in *S. demissum* the increase was from 2·51 to 4·34%. The content of ascorbic acid oxidase, polyphenol oxidase and peroxidase was determined in polyploids of *S. gibberulosum*, Katahdin and Frühe Rose [Early Rose] x Earlaine. According to the preliminary results, polyphenol oxidase activity is higher and ascorbic acid oxidase activity is lower in the polyploids than in the diploids.

S. schreiteri, *S. punae*, and *S. antipoviczii* cannot normally be crossed with cultivated varieties but after doubling the chromosomes of the wild species, such crosses were effected with relative ease. Only one berry was obtained from many crosses of *S. demissum* with *S. tuberosum*, after doubling the chromosomes. Most of the hybrids of *S. punae* and *S. schreiteri* with cultivated varieties had 72 chromosomes; a few berries had seeds with 96 chromosomes. Hybrids of *S. gibberulosum* with *S. parodii* had 48 or 96 chromosomes.

534 Świeżyński, K.
Selekcja ziemniaków na cechy użytkowe. **(Selection of potatoes for useful characters).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1958 : **2** : 659–86.

At Żelazna, Poland, crosses of late x late, early x late and early by midearly varieties were multiplied for 1–2 years without undergoing any selection other than the removal of infected plants. The mean yields of the crosses were similar to those of the parental varieties. Differences in yield between lines were generally significant, as were also interactions between lines and years. The average yielding capacity of very late lines was not lower than that of early and midearly lines, indicating that Steineck's method of selecting for high yield [cf. XXVII, 4138] is of doubtful utility. Early and late lines appeared in each cross, the percentages varying in different crosses. Early lines emerged earlier but showed less vigour at a later vegetative phase than late lines from the same cross. Early lines also had shorter stolons than late.

535 Samorodova-Bianki, G. B. & Murri, I. K.
(Potato flowers as a source of rutin).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1958 : No. 12 : 16–18. [Russian].

In studies of pigments in potato corollas at the Institute of Plant Industry, employing a chromatographic method, it was found that many different species and cultivars contained rutin or a related flavonoid. Considerable variability in rutin contents was observed, depending on species and variety. The highest value for rutin or a rutin analogue, 13·8% of the dry-matter content, was obtained for *Solanum polyadenium*. The cultivar Kameraz had a corresponding value of 5·8%, while the corollas of *S. schickii* contained no rutin at all. The colour of the corolla did not appear to have any relation to rutin content. Mention is made of chromatographic studies of hydrolysates of potato corollas, in connexion with some other experiments, in the course of which 27 potato species were found to give quercitin. Some of these species, for instance *S. phureja*, *S. catarthrum*, *S. stenotomum* and *S. tarijense*, had brightly coloured corollas; others, such as *S. gibberulosum*, *S. kesselbrenneri*, *S. ballsii* and *S. andigenum* f. *astilla*, had pale corollas, while *S. caniarense* and others had white corollas.

536 Bundesanstalt für Qualitätsforschung pflanzlicher Erzeugnisse (BAQ), Geisenheim, Rheingau. Tätigkeitsbericht 1958/59, 1. April 1958 – 31. März 1959. **(The Federal Institute for Quality Investigation of Plant Products, Geisenheim, Rheingau. Report of activity, 1958–59, 1 April 1958 – 31 March 1959).**
Pp. 31.

A brief mention is made of investigations carried out with 31 potato varieties; the results showed that there is no correlation between the content of crude or pure protein in the tuber and the biological value of the protein. Organoleptic tests of potatoes have also been effected.

537 Lampe, K.
Über die Widerstandsfähigkeit von Kartoffelknollen gegen Beschädigungen vor und während der Ernte. **(The resistance of potato tubers to damage before and during harvesting).**
Landb.-Forsch., Völkenrode 1959 : **9** : 38–42.

An instrument used for measuring the resistance of potatoes to bruising is described; it works on the same principle as a sliding-weight balance. Varietal differences in susceptibility to damage have been noticed.

538 Gustafsson, N.
Konsumentsynpunkter på kvaliteten hos olika potatissorter. **(Quality in different potato varieties from the consumer's point of view).**
K. Skogs- o. Lantbruksakad. Tidskr. 1959 : **98** : 165–80.

The results of laboratory tests and of a consumer preference test on the potatoes Bintje, Up to Date and Bona in Sweden were in good agreement, except that soggy consistency and blackening were regarded with greater disfavour by the consumers. Bintje was best liked and Bona least, the latter receiving particularly bad marks when grown in unfavourable localities.

539 BRÜCHER, H.
Kritische Betrachtungen zur Nomenklatur argentinischer Wildkartoffeln. V. Die Serie *Acaulia*. **(Critical considerations concerning the nomenclature of the Argentine wild potatoes. V. The series *Acaulia*).**
Züchter 1959 : **29** : 149–56.

Solanum acaule has an extensive distribution in the Cordilleras, being found at heights up to 470 m., and it also occurs as a weed in lower cultivated land. Considerable differentiation into races has occurred in these various regions. It is thought unnecessary to give the geographical races separate names and it is suggested that the varieties *subexinterruptum*, *caulescens*, *checcae* and *chorruense* and the species *punae*, *depexum* and *schreiteri* be considered as synonyms for the species *acaule*. In Jujuy a form with 36 chromosomes has been found and it is thought to be a hybrid between *S. acaule* and *S. alticolum*. Also the somatic chromosome number of *S. aemulans* was found to be $2n = 24$; *S. aemulans* is considered to be a species and not a form of *S. acaule*. It is endemic in the mountains of Famatina and Ambato in the provinces of La Rioja and Catamarca. Attempts to cross *S. aemulans* and *S. acaule* were unsuccessful in both directions.

540 HAWKES, J. G.
The Birmingham University Plant Collecting Expedition to Mexico and Central America.
Univ. Bgham. Gaz. 1959 : **2** : No. 5; and Pl. Introduct. Newslett. FAO 1959: No. **5** : 5–9.

A general account is given of the above expedition, made in 1958 with the purpose of collecting wild *Solanum* spp. and other plants.

541 NIEGOLEWSKI, Z.
Osiągnięcia w hodowli ziemniaka w zakresie odpornoście na zarazę ziemniaczaną. **(Attainments in potato breeding in the sphere of blight resistance).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1958 : **2** : 647–58.

In work conducted at the Polish stations at Wyszobór and Zamarte, methods of testing for resistance have been studied and interspecific crosses carried out. Two resistant varieties have been developed. Epoka, from R913 x Delfin, the former parent having *Solanum demissum* in its pedigree and the latter *S. andigenum*, is a highly productive midearly table potato; and Wulkan, from R913 x 860, the latter parent derived from a cross involving *S. demissum*, has a high starch content and is productive and resistant to virus Y and leaf roll.

542 GRAHAM, K. M., NIEDERHAUSER, J. S. & ROMERO, S.
Observations on races of *Phytophthora infestans* in Mexico during 1956–1957.
Amer. Potato J. 1959 : **36** : 196–203.

A high proportion of races 0, 1, 2 and 4 of *Ph. infestans* was found in two groups of *Solanum tuberosum* lacking genes for resistance. More highly specialized races, such as 1,2,4; 1,3,4 and 1,2,3,4, were obtained from lines of *S. demissum* and from F_1 hybrids of this species with *S. tuberosum*. Races 0 and 4 were isolated from *S. demissum* originating in the Rio Frio area, and race 0 was found on the S–434 clone of *S. demissum*, which carries no genes for resistance, at the Santa Elena Experiment Station. Isolates of *Ph. infestans*, found on seedlings of *S. bulbocastanum* resistant to race 1,2,3,4, have been identified as races 4; 2,4 and 3,4 thus indicating the presence of new races. In *S. cardiophyllum*, *S. oxycarpum*, *S. stoloniferum* and *S. demissum*, intraspecific variation in the degree of field resistance was noted and it has also been observed in *S. bulbocastanum*.

543 THURSTON, H. D., WILDE, P. & SUDIA, T. W.
Growth of six races of *Phytophthora infestans* on artificial media.
Phytopathology 1959 : **49** : 450–51.

Observations on six isolates of race 0 and on five other races led to the conclusion that many isolates of a given race should be studied before differences in ability to utilize specific compounds may be accepted as racial characteristics.

544 NIEDERHAUSER, J. S. & COBB, W. C.
The late blight of potatoes.
Sci. Amer. 1959 : **200** : 100–12.

The authors give a popular account of work carried out in Mexico on (1) testing material from other countries for resistance to late blight, (2) breeding for resistance and (3) the occurrence of races of the pathogen and the mode of origin of new races. The importance of this work, not only in improving the potato in Mexico but in countries throughout the world, is indicated. Breeding is now based on crosses between varieties and selections showing a high degree of field resistance under the severe conditions of testing at Toluca. Selections promising as regards this type of resistance have thus been procured within the short period of three years.

545 STELTER, H. & RAEUBER, A.
Untersuchungen über den Kartoffelnematoden (*Heterodera rostochiensis* Wollenweber). V. Die Veränderung einer Nematodenpopulation unter dem Einfluss widerstandsfähiger und anfälliger Kartoffel-Varietäten in einjährigen Topfversuchen. [**Investigations on the potato eelworm (*H. rostochiensis* Wollenweber). V. The alteration of an eelworm population under the influence of resistant and susceptible potato varieties in one-year pot experiments**].
Z. PflKrankh. 1959 : **66** : 572–82.

Cyst and larval numbers were determined in experiments in which two susceptible varieties, Aquila and Lü.55.452/2 F_1 (Aquila x *Solanum andigenum* 'CPC1673'), and three resistant varieties, Lü.56.186/27 F_2 [Apta x (Oberarnbacher Frühe [Oberarnbach Early] x *S. andigenum* 'CPC1673')], Lü.1230/11 F_1 (Apta x *S. andigenum* 'CPC1673') and Ka. 55.1140/5 F_1 (*S. andigenum* 'CPC1673' x Aquila), were grown in pots containing infected soil at Gross-Lüsewitz. Cyst numbers remained constant in the case of the resistant varieties; with the susceptible varieties, cyst numbers remained constant at first but rose steeply after 50 days. The numbers of larvae/cyst and larvae/100 cc. soil decreased in the case of all varieties for the first 60 days. Thereafter, the decrease continued for the resistant varieties but gave way to a sharp increase for the susceptible varieties.

546 TUROWSKI, W.
Wrażliwość różnych odmian ziemniaków na uszkodzenie masy zielonej. (**Sensitivity of different potato varieties to damage of the green parts**).
Roczn. Nauk rol. : Ser. A 1959 : **79** : 877–909.

[Cf. XXVII, 4167].

547 MALEC, K.
Obserwacje nad występowaniem mszyc na ziemniakach w 1953 i 1954 r. i nad zdrowotnością ziemniaków w Stacji Hod.-Bad. IHAR we Wtelenku. (**Observations on the occurrence of aphids on potatoes in 1953 and 1954 and on the health of potatoes at the Breeding Research Station of the Institute of Plant Breeding and Acclimatization at Wtelenko**).
Roczn. Nauk rol: Ser. A. 1959 : **79** : 823–32.

It is noted that Oka and Lenino were more resistant to leaf roll than the remaining five varieties studied; they were also among those showing the lowest incidence of aphids.

548 EDDINS, A. H.
Susceptibility of potato varieties and seedling selections to corky ringspot.
Amer. Potato J. 1959 : **36** : 187–90.

Twenty varieties and 33 USDA seedling selections, grown in cork-ringspot infested soil at Hastings, Florida, differed in their susceptibility to the virus. B294–65, B313–21, B606–3, B721–1, B3013–5, Boone and Delius proved to be resistant while, in B515–75, B936–12, Merrimack, Saco and Pungo, tuber infection did not exceed 0·9%. The most susceptible varieties, Kennebec, Red Pontiac and Sebago, had tuber infections ranging from 55·4 to 74%. The yield and other characteristics of cork ringspot-resistant varieties and selections were compared so as to determine their suitability for commercial growing. Merrimack, Pungo and Plymouth are recommended for planting in infected fields.

549 WEBB, R. E. & SCHULTZ, E. S.
The evaluation of potato seedling varieties for field immunity from potato virus A.
Amer. Potato J. 1959 : **36** : 275–83.

Information is given on greenhouse methods developed at the Crops Research Division, Beltsville, Md., to evaluate seedlings for field immunity from virus A. Four separate tests are involved. (1) To eliminate seedlings possessing the type of field immunity indicated by top necrosis in graft inoculation, inarch grafting with A-infected plants of USDA41956 is effected. (2) Seedlings showing mottling or no symptoms about 35 days after grafting are further tested by means of the indicator host *Solanum demissum* 'PI175404'. Diagnosis of susceptibility to graft inoculation is made in

4–6 days, by noting the development of local lesions on the indicator plants. (3) Susceptible seedlings are replanted and when the plants are 1–2 in. high they are infested with 25–50 infective aphids for 24 hr. (4) After 30–35 days, infection is diagnosed by means of PI175404. Seedlings not infected by aphid inoculation are considered to have the desired type of field immunity to A.

550 SEEMANTHANI, B.
Four foreign sweet potatoes beat Madras locals.
Indian Fmg. 1959 : **9** : No. 4 : 23–24.

Four varieties which have proved superior to local varieties in Madras State are described. V2 (FA17 White) is an early, Chinese variety which produces tubers very near the surface of the ground, so facilitating harvesting; the cooked flesh is creamy-white, sweet and fibreless. This variety has yielded 73% more than a local variety and is adapted to a wide range of conditions in different parts of the state. Another Chinese variety, V6 (FA17 Red), yields red-skinned tubers whose cooked flesh is yellow, sweet and fibreless. V12 (TST White), also of Chinese origin, yields uniform tubers light brown in colour and the cooked flesh has a fine taste, being creamy, sweet and nonfibrous. V8 (FB4004) is a high-yielding American variety with large white-skinned tubers tinged with purple; it also has creamy, sweet nonfibrous flesh.

FIBRES

551 SESHADRI AYYANGAR, G., VENKOBA RAO, M. & VENKATA REDDY, J.
Chinnapathi improvement work—past, present and future.
Indian Cott. Gr. Rev. 1959 : **13** : 39–43.

In an attempt to develop a medium-stapled white-linted cotton for the small Chinnapathi tract of Andhra Pradesh, varieties from other states have been introduced. Three medium-stapled varieties, 197–3, H420 and Pratap and a few Gaorani types gave promising results when compared to the local short-stapled variety, Anakapalle White.

552 KANNIYAN, K. & SIVASUBRAMANIAM, V.
Cotton improvement work in irrigated summer crop zone in the southern districts of the Madras State.
Indian Cott. Gr. Rev. 1958 : **12** : 304–10.

A survey of the improvement of varieties in Madras State, with special reference to the development of the Upland variety MCU–2, is given. The chief merits of this variety are its early maturity, high yields and good-quality lint. Some hybrid selections appear to be promising for developing varieties with longer and finer staple.

553 SESHADRI AYYANGAR, G., NAGESWARA RAO, P. & RAMA RAO, M.
Improvement of White Northerns cotton in Andhra Pradesh.
Indian Cott. Gr. Rev. 1958 : **12** : 311–15.

In an attempt to obtain a high-yielding white variety for the Northern tracts, Cocanadas–1, a red-tinted type, and several Coimbatore white *Gossypium arboreum* types have been crossed. Certain of the white selections of C–1 x 7036 have exceeded N14 in yield by 24–48% and in staple length, ginning, fineness and yarn strength. As there is little demand for coloured cotton it seems likely that a white type may have to be developed for the Cocanadas tracts, possibly from these selections, provided that they combine the genes for adaptability to both the Northerns and Cocanadas tracts.

554 SRINIVASA IYENGAR, G.
Cotton improvement in Mysore. I. Upland for red soils - rainfed.
Indian Cott. Gr. Rev. 1958 : **12** : 316–19.

The development of improved varieties, in particular MA–5 from Co–2 x Uganda and the subsequent production of hybrids between MA–5 and long-stapled, high-spinning American Upland types, is described. The performance of early American varieties from the Punjab, tested at Hiriyur and Mandya, is given; at both stations H–14 proved to be the most satisfactory variety. Hybrids between these and local varieties are being developed.

555 PANDYA, P. S., PATEL, S. M. & PATEL, P. K.
Improvement of Dholleras—Wagad cotton at Viramgam.
Indian Cott. Gr. Rev. 1958 : **12** : 289–95.

The development of the varieties Wagotar and Kalyan is briefly described. More recent work has been directed towards the production of an early, frost-resistant variety. Selection 280–1, from Kalyan x Russian H8–1, proved to be ten days earlier than Kalyan though it was lower yielding. However its ginning outturn, spinning capacity and fibre quality are slightly better than those of Kalyan. This selection and 394–3, from (Kalyan x Russian 223) x W87, have undergone extensive field trials.

556 TER-AVANESJAN, D.
(Cotton production in India makes progress).
Hlopkovodstvo (Cotton Growing) 1958 : No. 11 : 52–55. [Russian].

An account of cotton breeding in India is given.

557 ŠČERBINOVSKIJ, N.
(Cotton growing in Pakistan).
Hlopkovodstvo (Cotton Growing) 1958 : No. 10 : 56–57. [Russian].

Breeding involving local and American material is briefly referred to and the principal varieties now in cultivation are mentioned.

558 OWINGS, A. D. & DICK, J. B.
1958 Cotton variety tests in the Delta.
Miss. Fm. Res. 1959 : **22** : p. 7.

The results of tests with a series of varieties, including some new ones, at four stations in Mississippi are reported.

559 GUTIÉRREZ, M. & RYAN, G.
Colección de reactivos genéticos y citológicos y dobles haploides de algodón de la Estación Experimental Agropecuaria de Presidencia Roque Sáenz Peña. **(Collection of genetical and cytological markers and double haploids of cotton at the Agricultural Experimental Station of Presidencia Roque Sáenz Peña).**
Idia 1959 : No. 133 : 5–15.

The collection at the above station at Chaco, Argentina, includes the following: 32 lines carrying marker genes; two monosomic lines; two lines with translocations; and two doubled haploids. The material is being used in the study of inheritance in interspecific crosses, genome analysis, linkage studies and investigations on the effects of X and thermal-neutron irradiation. Descriptions of all the lines in the collection and a table showing which parental characters are transmitted in interspecific crosses are provided.

560 PANDYA, P. S. & PATEL, C. T.
Role of species crosses in cotton improvement.
Indian Cott. Gr. Rev. 1959 : **13** : 11–23.

A review of interspecific hybridization carried out at Surat, Bombay State, is presented [cf. XXVII, 3213, XXIX, 1761]. Two Indo-American hybrids, Deviraj and Devitej, are being commercially cultivated with success.

561 SAUNDERS, J. H.
The wild species of *Gossypium*. II. —The C and E genomes.
Emp. Cott. Gr. Rev. 1959 : **36** : 166–78.

Two species endemic to Australia and carrying C genomes, *G. sturtii* and *G. robinsonii*, crossed readily, the F$_1$ seed being 81% viable though many plants in the F$_2$ generation showed sterility or near sterility. The close affinity between *Notoxylinon australe* and *G. sturtii* has been further substantiated by the production of vigorous *N. australe* x *G. sturtii* hybrids, some of which have set seed. The difference between these two species may prove less fundamental than has been thought, in which case *Notoxylinon* may be reclassified as *Gossypium*.

G. incanum and *G. longicalyx* have recently been tentatively allocated to the E genome. Morphologically *G. incanum* is similar to *G. areysianum* and *G. somalense*. It has been successfully crossed with *G. stocksii*, *G. somalense* and *G. areysianum*. *G. longicalyx* is not similar as it has an entire leaf reminiscent of the D-genome species, though it does have the small yellow flower characteristic of the E genome. No seed has been obtained from crosses between *G. longicalyx* with other species of this section, though a few seeds were obtained from crosses between *G. longicalyx*, on the one hand, and *G. klotzschianum* (D$_3$) and *G. anomalum* (B$_1$), on the other. Its relic status suggests great age and it may prove to be far removed in relationship from the E genome.

Figures and taxonomic descriptions are given of *G. sturtii*, *G. robinsonii*, *G. stocksii*, *G. somalense*, *G. areysianum*, *G. longicalyx* and *G. incanum*.

562 MAHBUB ALI.
A note of grafting in cotton.
Pakist. J. sci. Res. 1959 : **11** : No. 1 : 1–3.

Using the approach and tube methods and *Gossypium hirsutum* as stock, hybrids involving various genomes were grafted in the greenhouse at College Station, Tex. Approach grafting gave more successful results than the tube method. The lack of success in the case of some grafts appeared to be associated with genomic constitution rather than degree of polyploidy. Most of the failures were hybrids involving genomes A$_2$ and D$_1$.

563 GANESAN, D.
Breeding for adaptation to rain-fed conditions in upland cottons, by interspecific hybridisation.
India Cott. Gr. Rev. 1958 : **12** : 296–303.

The difficulty of breeding cotton for mesophytic conditions is discussed. Selections have been made using material involving *Gossypium hirsutum*, *G. tomentosum* and *G. herbaceum.* Later selections were derived from three of the F_1 progenies. Four of these selections, particularly CT 14–21 and 4–19, proved to have longer staple, lower fibre weight and stronger fibre than Indore–2, an improved local *G. hirsutum* type, in addition to ability to recover from waterlogged conditions. Only fibre maturity is not completely satisfactory.

564 M., M.
(A master in transforming plants).
Hlopkovodstvo (Cotton Growing) 1958 : No. 12 : p. 45. [Russian].

Experiments on distant hybridization of cotton conducted by Silaev in Azerbaijan are mentioned. The practical results include early, high-yielding long-fibred forms obtained from pollination of the cotton cultivar 1298 with *Hibiscus* pollen. Other hybrids are reported from crosses of cotton cultivars with kenaf, *Malva*, *Althaea*, *Lavatera* and other *Gossypium* species such as *G. sturtii* and *G. thurberi.*

565 MAKSIMENKO, I. K.
(The new Soviet fine-fibred cotton variety 8763I).
Agrobiologija (Agrobiology) 1958 : No. 6 : 75–79. [Russian].

The above cultivar was bred from a *Gossypium barbadense* form and a recent Soviet variety, 6890I, at the Iolontan' Breeding Station, Turkmenistan. It is an early fine-fibred variety suitable for combine harvesting, more productive than the local high-yielding standard 5476I and has better technological properties than 21Z, which is outstanding in this respect among fine-fibred cottons.

566 KAMMACHER, P.
La production artificielle d'aberrations chromosomiques chez *Gossypium hirsutum* par les rayons X. **(The artificial production of chromosome aberrations in *G. hirsutum* by X rays).**
Cot. et Fibr. trop. 1958 : **13** : 269–88.

Germinating seeds were exposed to 600 and 1200 r. of X rays, the stronger treatment producing most aberrations. The chromosomes behaved as though they had not divided at the time of the treatment; any chromatid aberrations produced did not survive until meiosis. Although breaks could occur anywhere in the chromosome arms, most were found in the central regions of the arms. The fragments usually rejoined soon after breakage; in some cases the normal chromosomes were reconstituted and in other cases reciprocal translocations involving two or three pairs of chromosomes occurred. Only monocentric rearrangements were observed at meiosis; if any acentric and dicentric formations had been produced, they were eliminated before meiosis occurred. Monocentric rearrangements resulting in the production of quadrivalents and hexavalents are more likely to occur when there is one break in a chromosome than when there are several breaks. Closed rings appeared at metaphase I when all the breaks occurred near centromeres; various other configurations were found when breaks were further from the centromeres, interstitial chiasmata being formed. Sometimes the rejoining was not effected until after the chromatids were formed and this resulted in centromeres being lost. In this way monosomics may be produced. It appears that in some chromosomes which lost their telomeres as a result of X irradiation the broken ends were able to function as telomeres and these chromosomes were then able to pair with normal chromosomes. Some of the plants from irradiated seed had different aberrations in different branches but these chimeras did not appear to be frequent.

Aberrations detected in X_1 plants were usually transmitted to the next generation so X irradiation can be a useful method of producing translocations and monosomics.

567 ROUX, J.-B.
L'haploïdie chez le cotonnier. **(Haploidy in the cotton plant).**
Cot. et Fibr. trop. 1958 : **13** : 289–92.

Amongst 44,000 seeds of various Sea Island cottons examined at Stoneville, 141 pairs of twin embryos were found; of these, 112 appeared to consist of one diploid and one haploid. The percentage of haploids varied between 0·1 and 1·6% amongst these varieties. In *Gossypium hirsutum* cottons, the average frequency of twin embryos was one pair in 20–25,000 seeds but the proportions of diploids and haploids are not known. It is probable that a tendency to polyembryony is an inherited character.

It is thought that it would be useful to look for haploids in all varieties; pure lines could be obtained from the haploids and would provide stable standards of reference for measurable characters. Other uses of haploids are also mentioned.

568 GRINENKO, V.
(The question of physiology of earliness in cotton).
Hlopkovodstvo (Cotton Growing) 1958 : No. 12 : 23–33. [Russian].

The results of comparative studies of photosynthetic processes in an early variety, a midseason and a late one throughout the growth period in Taškent are presented in tabular form. The early cultivar 147F had a higher ratio of dry-matter content of the reproductive organs to that of the vegetative organs at the early growth stages than the midseason 108F or the late-maturing S1472. The rate of synthesis of cellulose in the bolls of the early form was higher than that of the later-maturing varieties in the initial stages of development. The protein fraction of the nitrogen content in the seed of 25-day-old bolls was appreciably higher in the early form as was also the oil content of the seed. There was hardly any difference between the varieties in these respects after the bolls were 45 days old.

569 PUDOVKINA, Z. M. & TRIBUNSKI [TRIBUNSKIJ], A. N.
Modificarea dirijată a precocităţii bumbacului. **(Directed modification of the earliness of cotton).**
An. Romîno-Soviet. : Ser. Agric. 1956 : No. 4 : 70–82.

[Cf. XXVI, 1469].

570 CROSS, J. E. & RICHMOND, T. R.
The use of glandless seed to determine the amount of natural crossing in *Gossypium hirsutum*.
Agron. J. 1959 : **51** : 511–12.

One method of determining the proportion of natural crossing in cotton involves planting a mixture of two stocks, one carrying a marker gene and one its recessive allele. Glandless seed has been found to be a useful marker; the presence of glands in embryos in bolls of inherently glandless plants gives positive evidence of hybridization; it is not necessary to raise plants from the seed.

571 KOTTUR, K. G.
Maintenance by bud-grafting as a means of preventing deterioration in cotton strains.
Indian Cott. Gr. Rev. 1958 : **12** : 332–34.

It is suggested that the deterioration of strains by selfing or by pollination with inferior strains could be prevented if seed suppliers bud grafted the strain at the best stage of its performance on to perennial stocks. By this method it is possible to perpetuate the strain indefinitely.

572 JENGAR [IYENGAR], R. L. N.
(Scientific investigations of the technology of the cotton fibre in India).
Hlopkovodstvo (Cotton Growing) 1958 : No. 12 : 46–49. [Russian].

This review of the activities of the Central Cotton Committee of India mentions hybridization and introduction aimed at increasing the length of fibre in native cottons. A few varieties and hybrids showing promise are mentioned.

573 **Technological reports on standard Indian cottons, 1957.**
Technol. Bull. Indian Cott. Comm. : Ser. A 1958 : No. 95 : Pp. 112.

This bulletin provides a report of tests on the fibre properties and spinning performance of samples of 23 varieties chosen as standards from the 1956–57 crop [cf. XXVIII, 1877].

574 **Oil content values of cotton seed samples from various states determined at the technological laboratory, Matunga, during 1956–57 and 1957–58.**
Indian Cott. Gr. Rev. 1959 : **13**: 75–79.

The oil-content values of seeds of different varieties of *Gossypium arboreum*, *G. herbaceum* and *G. hirsutum* from various states are tabulated.

575 BEDERKER, V. K.
Breeding long stapled Hyderabad Gaorani cotton.
Indian Cott. Gr. Rev. 1959 : **13** : 155–60.

In an attempt to evolve Gaorani strains with a fibre length of 1·00 in. or over, several individual plant selections have been made with a halo length of 26 mm. or over. Some of these progenies have maintained a halo length of 26–28 mm. for two successive years. The relationship between halo length and fibre length is discussed.

576 KAIWAR, S. R.
Maintenance of purity in cottons and their multiplication.
Indian Cott. Gr. Rev. 1958 : **12** : 335–36.

The "type group method" of maintaining the purity of a strain is described. This is carried out over a five year period and can be repeated successfully as is shown in the case of the variety Ashmouni which has shown no deterioration after 20 years.

577 Govande, G. K. & Ramasubrahmanyam, K. V.
Improvement of cotton in Middle Gujarat (Bombay State).
Indian Cott. Gr. Rev. 1959 : **13** : 96–100.

The development of the varieties Vijay and Digvijay is described. A long-stapled type from Surat, 1802, isolated from the back cross (1027 ALF x Persian 211) x 1027 ALF has been crossed with Early 22. Some of the resulting progenies have a strong fibre, 1 inch or more long. In particular, 92 has proved very promising. In the northern part of the tract an attempt is being made to evolve a high-quality but early frost-resistant variety.

578 Last, F. T.
Effect of cotton leaf resistance factors on the spread of *Xanthomonas malvacearum* (E. F. Sm.) Dowson in the Gezira, Sudan.
Emp. Cott. Gr. Rev. 1959 : **36** : 187–95.

Various leaf resistance genes in strains of *Gossypium hirsutum* and S and L types of *G. barbadense* were tested for their ability to limit the natural spread of *X. malvacearum* in the Gezira. Of the genes and combinations, B_2 proved to be least effective in preventing spread, B_2 and B_3 combined were intermediate, and combinations with B_{6m} were the most effective. Varieties with B_2B_{6m} did not differ appreciably from those with $B_2B_3B_{6m}$.

579 Kaiwar, S. R., Kottur, K. G. & Rao, S. B. P.
A resume of progress made in Dharwar-American Cotton Improvement Scheme at Gadag.
Indian Cott. Gr. Rev. 1959 : **13** : 109–15.

The development of Laxmi from Gadag–1 x Co–2 is described. More recently, attempts have been made to evolve types superior to Laxmi in fibre length and strength and resistance to red leaf and black arm by introducing the best *Gossypium hirsutum* strains from other states, Indo-American types from Surat and exotic varieties from abroad, but they proved unsuitable for the Dharwar tract. From a number of crosses and back crosses made to combine economic characters and resistance to diseases only two progenies, 49–2 (Perso-American x Gadag 1) x 4411–3 and 10 (9766 x Kampala), were found to combine all the desired fibre properties, but they had a lower yield than Laxmi. It appears that to get maximum vigour from the F_1 hybrids of *G. hirsutum* x *G. barbadense*, one of the parents should be an acclimatized variety of the tract for which hybrid vigour is being exploited.

580 Last, F. T. & Dransfield, M.
Measurement of the resistance of cotton to *Xanthomonas malvacearum* (E. F. Sm.) Dowson using a leaf abrasion technique.
Emp. Cott. Gr. Rev. 1959 : **36** : 196–99.

In this local-lesion technique, the wetted upper leaf surfaces of the four youngest fully expanded leaves of eight plants of strains of *Gossypium hirsutum* and S and L types of *G. barbadense* were gently abraded before being rubbed with a drop of inoculum of *X. malvacearum*. After inoculation no special precautions to maintain high humidities were taken. This technique has a number of advantages over the leaf-spray technique, the most important being: (1) it is independent of weather, (2) much can be achieved with few plants and little inoculum and (3) the results are given by direct counting. In this test, lesion size was largest on the most susceptible strains and successively decreased with the addition of the genes B_3, B_2, B_2B_3 and $B_2B_3B_6$.

581 Gutiérrez, M., Campagnac, N. & Podestá, M. H.
Ensayos comparativos de variedades de algodón en áreas con "marchitez". **(Comparative trials of cotton varieties in areas with wilt).**
Idia 1959 : No. 137 : 24–32.

The results of trials of 19 resistant and six susceptible varieties, conducted in various localities in Chaco, Argentina, indicated that the best varieties were the Argentine cotton Sáenz Peña M58 and the imported variety Coker 100 Wilt BR, both of which combine resistance with good agronomic and industrial characters. Dixie King was also a good resistant variety.

582 Avtonomov, A. A.
(A method of early diagnosis of the resistance of fine-fibred cotton varieties to *Fusarium* wilt).
Hlopkovodstvo (Cotton Growing) 1958 : No. 11 : 35–36. [Russian].

The Egyptian method of testing breeding material in the greenhouse, which, with minor modifications, is used at the All-Union Cotton Institute, is described. It is more accurate than the ordinary field method and moreover the results become available before sowing time in the same year. A table shows the percentage of plant losses due to *Fusarium* in greenhouse and field tests of some varieties and hybrids.

All plants of the F_1 hybrid of S6015 x S6022 survived in both tests.

583 Stephens, S. G.
Laboratory studies of feeding and oviposition preferences of *Anthonomus grandis* Boh.
J. econ. Ent. 1959 : **52** : 390–98.

Boll weevils were offered the choice of flower buds of two cotton strains, #50 and #6, in order to find the adult insects' preferences for a host plant, a feeding site and an oviposition site. Strain #50 was homozygous for both hairy-mutant genes, M_1 and M_2 [cf. XXIX, 516], and had a normal complement of resin glands, while #6 was glabrous and glandless. The weevils found the flower buds of #50 more easily than those of #6, both in continuous light and in dark conditions. The ability of the insects to feed and oviposit was similar in the two strains when no choice was offered. However, with a choice available, the weevils showed a marked feeding preference for #6 and preferred to oviposit on #50. This feeding preference became weaker as the total food available diminished. These results suggest that the presence of glands is an important factor in attracting weevils to the plant and is probably of importance in stimulating oviposition, but that glabrous buds are preferred for feeding.

584 **Cotton strains show bollworm resistance in extensive trials.**
Crops & Soils 1959 : **11** : No. 10 : p. 35.

A brief mention is made of research on the physiological and morphological characteristics conferring resistance to pink bollworm. Certain heritable features either make it difficult for the larvae to develop or cause the females to deposit their eggs on the exposed parts of the plant instead of inside the plant or boll. It has been found that on *Gossypium thurberi* and a cross of *G. tomentosum* x *G. hirsutum* (Stoneville 2B) many larvae do not survive. In a third strain larval development was retarded. No variety combining resistance with desirable agronomic characters has yet been found.

585 Brazzel, J. R. & Martin, D. F.
Pink bollworm resistance in cotton.
J. econ. Ent. 1959 : **52** : 385–90.

[Cf. XXIX, 517].

586 Khan, A. H.
AC.134—a new long staple variety of cotton for Montgomery and Lahore districts.
Pakist. Cott. 1959 : **3** : No. 3 : p. 39.

Developed at Lyallpur, AC134 is superior in yield and quality to 289F/43, 238F and 4F. On account of its profuse hairiness, it is resistant to attack by *Empoasca devastans.* The bolls are medium sized with a ginning outturn of 37·0%, and the seeds have 3–4% more oil than those of 289F/43, LSS and other varieties.

587 Frąckowiak, F.
Wyniki dóswiadczeń z odmianami lnu włóknistego z lat 1951–1953. **(Results of trials of fibre flax in the years 1951–1953).**
Roczn. Nauk rol. : Ser. A 1957 : **77** : 401–37.

In the above trials, conducted at 19 stations throughout Poland, the ten varieties tested fell into two groups, the first characterized by consistently high yields of straw and fibre under various conditions and the second by lower yields and quality, particularly under poor conditions. The varieties Len z Niedźwiadki [flax from Niedźwiadka] and LCSD210, both in the first group, were also drought resistant.

588 Kartaševa, A. V.
(Testing Dutch varieties of fibre flax in the USSR).
Lën i Konoplja (Flax & Hemp) 1958 : No. 10 : p. 27. [Russian].

Five Dutch varieties were tested near Moscow and were all found highly productive of seed and fibre and resistant to lodging and diseases. The yield of fibre from the stems by all Dutch varieties, except Noblesse, was below that of the Soviet variety Svetoč [Torch]; Noblesse yielded 24·2% fibre, including 19·8% long fibre, the corresponding values for Svetoč being 23·7% and 19%.

589 Čanev, K.
(The problem of flax and hemp in our country).
Selskostopan. Misăl 1958 : No. 12 : 881–92. [Bulgarian].

The new Bulgarian flax Plovdiv 242 has outyielded the best Soviet and Dutch cultivars in recent trials at Samokov and other districts of Bulgaria. The increments in stem yields by comparison with Svetoč [Torch], 1288/12, 806/3 and the Dutch variety Concurrent [Rival] amounted to 28·2, 23·5, 20·6 and 34·4% respectively. The fibre of the new variety was of high quality. The hemp Bologna is at present the most productive variety grown in Bulgaria. It exceeds the yield of the commonly grown cultivar G–3 by 25%.

590 Bruni, O.
Raza 267 de *Melampsora lini*, nueva para el país. **(Race 267 of *M. lini*, new to the country).**
Idia 1959 : No. 139 : 25–26.

The new race that has appeared in Argentina attacks the flax variety Bombay which has served as the parent for a number of the new rust-resistant varieties of flax and linseed. Two selections have proved immune to this race, namely 10·678–3 flax and EEP6879 linseed.

591 Arinštejn, A. I. & Senčenko, G. I.
(Breeding work with hemp in the Soviet Union).
Lën i Konoplja (Flax & Hemp) 1958 : No. 10 : 24–27. [Russian].

This review of breeding since 1917 refers briefly to the following recent cultivars. Togučin 1 was obtained by hybridization between land varieties from the Kujbyšev and Omsk provinces; it has the same growth period as the hemp variety grown in the Novosibirsk province, equals it in seed yield and produces 24% more fibre and 34% long fibre. Gluhov 1 was selected from Novgorod-Severskij; it has a shorter growth period than the mother variety and 3% higher stem and 24–25% higher fibre yield. Gluhov 3, a hybrid between Novgorod-Severskij and JuS1, is superior to the former in fibre yield and tolerance of drought at Černigov. In addition to the above varieties, mention is made of hybrids involving Južnaja Čujskaja [Southern Čujsk], American and Krasnodar which have higher yields of stems and fibre than JuS1. Also mentioned are monecious types of southern and central Russian hemp which have reached an advanced trial stage.

592 Roy, R. P. & Sinha, R. P.
Meiotic studies in *Crotalaria sericea* Retz. and the basic number in the genus *Crotalaria*.
Curr. Sci. 1959 : **28** : p. 253.

Investigation of the wild species *C. sericea* indicated that while most of the PMCs were meiotically regular and gave rise to gametes with $n = 8$, some were irregular, gametes with $n = 7$ or 9 being produced. Attention is drawn to the significance of this finding in the problem of determining the basic number of the genus.

593 Ioffe, R. Ja. & Korbut, I. M.
(Urgent tasks).
Lën i Konoplja (Flax & Hemp) 1958 : No. 11 : 25–27. [Russian].

The sowing of high-yielding varieties of kenaf such as Kuban' 333 is among the measures recommended for raising kenaf production in the USSR. Kuban' 333 yields 4·6% more stems and 27·4% fibre than 3876, a variety which has recently superseded the less productive 21 and 1187.

594 **New sisal hybrid.**
Kenya Frmr. 1959 : No. 38 : p. 30.

A hybrid which appears to be successful has been produced in Tanganyika. It requires highly fertile soil but has a yield of 500 to 600 leaves compared with an average of 200 for the usually grown variety, and a cutting period every six months against twelve months for the usual variety.

595 Riley, H. P.
Chromosome numbers in Aloe.
J. S. Afr. Bot. 1959 : **25** : 237–46.

Chromosome numbers reported by the author and other investigators for representatives of *Aloe* are listed. Taking together all the species, varieties, horticultural forms, hybrids and unidentified plants, 95% are diploids and only 5% polyploids.

SUGAR AND STARCH PLANTS

596 Brett, P. G. C.
The development of sugarcane breeding in South Africa and its results.
S. Afr. Sug. J. 1959 : Suppl. : Bull. Exp. Sta. S. Afr. Sug. Assoc. No. 10 : Pp. 8.

This short popular survey deals with (1) the problem of low pollen fertility under field conditions in South Africa and ways in which it has been overcome, and (2) progress made in seedling production and selection. Varieties now undergoing final stages of testing were selected from the very limited numbers of seedlings raised during the first few years of breeding in Natal. Although none appear to be superior in yield to the present commercial canes, several are comparable. N50–211, for example, has given yields up to commercial standard, is very easily trashed and shows good resistance to the more serious diseases, although it tends to lodge and flower. N51–168 is another promising cane. Varieties equal but not superior to the present commercial canes could serve as substitutes for the latter in the event of their deterioration or may prove of value under specialized conditions.

Annual Report of the Mauritius Sugar Industry Research Institute 1958 : Pp. 103.

597 *Sornay, A. de & George, E. F. Cane breeding. (pp. 29–44).*

Other varieties, besides M63/39, have shown a high negative correlation between male fertility and altitude. Information is given on the parentage of crosses effected in 1958. Sib crossing of proven parents is in progress as this method may possibly lead to better varieties than hybridization between seedlings whose value as parents is uncertain. As a preliminary to the possible use of the hot-water method of emasculation in view of the partial self fertility of sugar cane in Mauritius, the effects of immersion for various times at 35–55° C. were determined for both the ♂ and ♀ flowers. Varieties differed markedly in heat resistance of the flowers but in each case combinations of time and temperature could be found with which the anthers failed to turn red and dehisce. Notes are given on the performance of promising new varieties meriting further trial under a diversity of environmental conditions. The 2*n* numbers found most frequently in the commercial varieties M147/44, Ebène 1/37, M31/45, M134/32 and M112/34 were respectively 108, 124, 102–108, 97 and 106, but very wide departures from these numbers were noted in both leaf and root tissues and sometimes even in adjacent cells. It is suggested that such variability may be due to irregular divisions or somatic reduction. The varieties are of complex hybrid origin.

598 STAFFORD, T. J., MATHERNE, R. J. & HEBERT, L. P.
Results of sugarcane variety tests in Louisiana during 1958.
Sug. Bull., N. Orleans 1959 : **37** : 293–303, 305.

The results of trials of commercial and unreleased varieties are given. The new variety CP52–68 continued to give higher yields of sugar per acre than the standard variety CP44–101 on both light and heavy soils. CP51–21 and CP53–18 were approximately equal in the yield of sugar per ton of cane to CP48–103. CP53–1 was about equal to CP44–101 in yield of cane per acre, and approximately equal to CP44–101 in yield of sugar per ton on light soil but was higher on heavy soils. N.Co.310 gave good yields of both cane and sugar, and in addition is a vigorous, cold-resistant variety.

599 **1959 sugarcane variety recommendations for Louisiana.**
Sug. Bull., N. Orleans 1959 : **37** : 304–05.

The results of tests carried out over a period of several years are summarized. CP44–101 appears to be the most valuable variety for general planting, though some other varieties, such as N.Co.310 and CP52–68, are also recommended.

Sugar Bulletin of the Department of Agriculture, British Guiana 1959 : No. 27 : Pp. 88.

600 *Field experiments with sugar cane, XXVII. (pp. 1–52).*

A detailed report is provided of the results of variety trials of Barbados and other canes in British Guiana.

601 RAHEJA, P. C.
Performance of sugarcane varieties in relation to ecological habitat.
Indian J. Sugarcane Res. Developm. 1959 : **3** : 127–30.

An ecological approach to variety testing is advocated, the significance of ecological factors being illustrated by a discussion of water relations.

Annual Report of the Experiment Station of the South African Sugar Association for the year 1957-58 : Pp. 33.

602 *Brett, P. G. C. Cane varieties. (pp. 17–19).*

N:Co310 constituted 60% of the total crop. Variety trials showed highest yields in their respective series from N:Co376, N:50/123 and N:52–340. Selections in the N:54 and N:55 series have been made and seedlings planted for variety trials, together with introduced varieties.

603 *Thomson, G. M. Cane diseases. (pp. 20–24).*

Information is given on the susceptibility to ratoon stunting disease of a number of varieties. Some data are also given on the incidence of mosaic disease and chlorotic streak.

604 **Twenty-fourth Annual Report of the British West Indies Central Sugar Cane Breeding Station, Barbados for the year ending September 30th, 1957 :** Pp. 46.

Detailed information is provided on the numerous crosses made in the period under review and on the results of trials of seedlings derived from the earlier series of crosses. Many of the crosses were between related parents, since it had been found from previous results that this type of cross in interspecific hybridization is likely to yield valuable material because of a concentration of desirable genes.

Tests of the Hawaiian technique of using cut arrows in a preservative solution gave encouraging results.

Further selfings were made in lines being developed from B2935, B3337, B34104, B35276, B37161, B4098, B41211 and B41227. A number of top crosses were made for the evaluation of inbreds. Two interline crosses of inbreds, U131 x D25 and C32 x U112, gave large seedling populations of an attractive type, with a high degree of vigour at the nursery stage. Progeny testing of inbreds, even in the early stages in their production, is regarded as important. Although desirable dominant and recessive genes may be easily fixed by selfing, those responsible for the heterosis on which superior performance mainly depends may be less easily fixed and possibly even lost unless the progeny test is applied. Major characters have become stabilized in many lines. For instance, lines in series D from B41211 are distinguished by yellowish canes with tumescent internodes and pale foliage, and those in series E from B3337 by dark red or purple canes, leaf sheaths with considerable anthocyanin pigmentation and upright habit of the leaf. No relationship has been found between vigour and flowering among inbreds. Some of the least vigorous S_3 and S_4 lines of interspecific origin are the heaviest arrowers while some vigorous derivatives from B34104 and B41227, both of which arrow freely, fail to arrow or flower only sparsely. Amount of arrowing, like juice quality, is therefore concluded to be partly due to particular combinations of polygenes, and not related to yield. As was expected, male fertility, a genetically controlled character, has become fixed by selection after three or four generations of inbreeding. A number of inbred lines, particularly from B34104, B4098 and B41211, have given comparatively high Brix readings.

Examination of the following Barbados noble canes showed that they possessed the 80 chromosomes characteristic of *Saccharum officinarum* and had therefore arisen from reduced parental gametes in the normal way: B391, B417, B603, B2935, B3013, BH10(12), Ba.11569 and B6032. Imported noble canes also found to have $2n = 80$ were Otaheite, Badila, Ajax, 28NG13 and CP36–116. Inbreds representing the first, second and third generation of selfing were also studied cytologically. Selfs from noble canes, in which meiosis is regular, had $2n = 80$. In lines from varieties of interspecific hybrid origin, $2n$ numbers different from those of the parent variety were usual, some chromosomes often being lost during inbreeding. Such losses were particularly noticeable when segregation had resulted in major morphological departures from the parental type, as in lines from B35276 and B4362. When fixation of characters had taken place early in the development of a line, as in derivatives of B3337, B4098 and B41211, chromosome losses were few. Since in such cases the $2n$ numbers were well over 80, it is evident that several nonnoble chromosomes remained. This observation is important as these chromosomes carry genes for desirable characters.

No mutants were secured by exposing dry fuzz of an inbred from B41211 to 50–1000 r. of X rays. In a second experiment, germinating fuzz of an inbred of B35276 was irradiated with 50–250 r.; seedlings from this fuzz have been planted in the nursery.

605 STEVENSON, G. C.
The British West Indies Central Sugar Cane Breeding Station—twenty-five years' progress.
Proc. Brit. W. Ind. Sug. Tech. 1957 : 24–33.

Sugar-cane breeding and ancillary cytogenetical research at the above station in Barbados are surveyed and assessed.

606 **1958 report of the Experiment Station Committee of the Hawaiian Sugar Planters' Association.** Pp. 78.

Using parents of outstandingly high juice quality, further hybridization was effected by the melting-pot method. The proposed revision of the procedure of seedling testing at the regional stations is outlined. It entails preliminary evaluation of seedlings under two-year cropping in 30′ x 24′ plots harvested by slash cutting. It is expected to have the following advantages: doubling or tripling of the number of seedlings tested while keeping costs per plot at a minimum, reduction in the number of canes in the subsequent 40′ x 40′ plantation trials and an improvement in the proportion of promising seedlings. Cytological investigation of wild and noble canes continued.

607 **Bureau of Sugar Experiment Stations. 58th Annual Report of the Director to the Hon. the Minister for Agriculture and Stock, Brisbane, Queensland 1958** : Pp. 110.

Sugar cane. Selection of seedlings continued at the various stations. Further crosses were effected. Investigations into methods of selection, such as bunch *v.* single planting, also continued. Determination of the most efficient rate of increase of selections was carried a stage further. At present it appears that grading of first selections is desirable, with the highest grade to be planted in 40-sett or 30-sett plots and the lower grades to be observed for an additional period in 10-sett or 4-sett plots. It has been concluded that replacement of full stalk sucrose determinations by the less laborious and time-consuming use of refractometer Brix readings of samples obtained by puncturing the stalks at three places is justified in the later stages of selection, although full sucrose determinations will still be made on a limited scale. Q61 and Q64 were approved in 1957. Q61 is a vigorous variety suitable for the Bundaberg district and Q64 is a thicker type. Recommended for the far northern region, Q64 will probably be of restricted use, particularly on account of its susceptibility to leaf scald. Q66 and Q67, outstanding for their lodging resistance on rich lands, were approved for distribution in 1958. Q63 and Q65 were approved for release in 1958 for the central district [cf. XXIX, 1796]. The main advantages of Q63 are exceptionally high sugar content, high yield and rapid germination. Q65 is a late-maturing type with which it is hoped to strengthen the latter end of the crushing season at Mackay. The distribution of Q68, an exceptionally vigorous cane expected to be of value on poor soils in the central district, is planned for 1959. In the southern district, Q70, a vigorous cane of Hawaiian parentage, was approved for planting in 1958 and promises to be useful for irrigated conditions. Among the varieties which may shortly attain "Q" status are L622 and M251, notable for their resistance to lodging on rich lands.

Cowpea. Selection of hybrid derivatives for wilt resistance and bean fly is receiving attention. In trials of varietal resistance to wilt, only CPI12153 and Black Eye 5 have shown considerable resistance in all trials. More than one pathogen may cause wilt, since the presence of both *Phytophthora* sp. and *Fusarium* sp. is suspected in legumes in north Queensland.

608 Dunckelman, P. H.
Effectiveness and implications of breeding sugarcane in an indoor environment at Canal Point, Florida.
Sug. Bull., N. Orleans 1959 : **37** : 229–52.

Breeding at Canal Point from 1918 onwards is reviewed and future plans are outlined. During 1958, 415 biparental crosses were made successfully in an indoor environment, thus eliminating the hazards of outdoor breeding. CP52–68 was released for growing in Louisiana.

609 Khanna, K. L., Sharma, S. L. & Srivastava, R. C.
Outstanding canes of Bihar: IV—B.O. 14.
Indian J. Sugarcane Res. Developm. 1959 : **3** : 141–47.

A further instalment in this series [cf. XXIV, 4173] gives information on the sugar cane BO14 with respect to its origin, morphological features and agronomic performance. Released in 1955, the variety is notable for a combination of high yield with resistance to red rot, waterlogging and drought.

610 **Distribution of new variety N50/211.**
S. Afr. Sug. J. 1959 : **43** : p. 597.

The sugar cane N50/211, from POJ2735 x Co.285, has proved promising in the main part of the coastal belt and on alluvial soils but not on coastal sands or in the high-altitude areas. It has shown good resistance to smut, mosaic, red rot and gumming, but is not superior in yielding ability to the best of the present commercial varieties. It does not tiller profusely but produces a good length of medium to thin cane. Its sucrose content is above or slightly below average.

611 Story, C. G.
Q.68.
Cane Gr. quart. Bull. 1959 : **23** : 10–12.

Q68 (POJ2878 x Co.290) reached the status of an approved sugar-cane variety for the Mackay and Proserpine mill areas in Queensland in 1959 [cf. 607]. It produces good quality sugar early in the season, maintaining this quality until late harvest. In trials of cane and sugar yields, it has compared favourably with Q50. On account of its vigour, the variety is suitable for cultivation on the poorer soils. So far it has shown resistance to red rot, gumming and downy mildew and tolerance of ratoon stunting.

612 Volp, P.
Q.66 in the Mulgrave area.
Cane Gr. quart. Bull. 1959 : **23** : p. 21.

The sugar cane Q66 was approved for the above area in Queensland in 1957 [cf. 607]. Although it has the drawback of being highly susceptible to diseases, it is considered that the following advantages of the variety on rich soils justify its retention on the approved list: high degree of resistance to lodging; good germination, vigorous stooling and rapid growth, which promote weed control; and superiority in sugar content over Badila, Trojan and Pindar under comparable soil conditions.

613 PANJE, R. R. & SRINIVASAN, K.
Studies in *Saccharum spontaneum*. The flowering behavior of latitudinally displaced populations.
Bot. Gaz. 1959 : **120** : 193–202.

Among 341 clones, collected from latitudes 5°–35° N. in India and grown at Coimbatore (11° N.), those from 5°–19° N. all flowered while among those above 20° N. the number flowering was inversely related to the latitudinal distance from Coimbatore. Tested over a period of six years, most clones tended to flower either every year or not at all. Clones were also grown at Karnal (29° 42′ N.), and in those which flowered at both latitudes, flowering was generally later at Karnal. Clones native in latitudes 25°–29° N. flowered earlier at Karnal than clones native in latitudes 10°–14° N. did in Coimbatore; when the former group was grown at Coimbatore and the latter at Karnal, they were respectively accelerated and delayed in flowering by about 40 days. This gives a mean shift in flowering date of 2·4 ± 0·09 days per latitudinal degree. From this value, the approximate date of flowering in the native habitat has been calculated on the basis of flowering times at Coimbatore and Karnal. The calculated date was correlated positively with the ending of the monsoon in that region, a factor which has probably had an important selective effect upon the species. It is noted that variants from areas of high rainfall in Assam and Nepal fail to flower both at Coimbatore and at Karnal, although the latter is at about the same latitude as the original habitat; these may in some cases be induced to flower by allowing them to grow for a second year. It has also been observed that flowering is profuse in dry areas with a short seasonal monsoon and in areas subject to periodic waterlogging. It is suggested that the tendency to excessive flowering in interspecific hybrids with sugar cane may be overcome by the use of normally nonflowering variants of *S. spontaneum* as parents, or by the use of late-flowering variants or of variants specially sensitive to latitudinal displacement.

614 CHIRANJIVI RAO K. & GOPALA AIYAR, K. V.
On the amino-acid nitrogen content of cane juices.
Curr. Sci. 1959 : **28** : 289–90.

The aminoacid nitrogen content of nine varieties is reported; the values, expressed as glycine, ranged between 15 mg. and 59 mg. per 100 g. of juice.

615 NILAMBAR MUKERJI & MASOOD ALAM
Roots as indicator to varietal behaviour under different conditions.
Indian J. Sugarcane Res. Developm. 1959 : **3** : 131–34.

The results are given of a preliminary study of root development in the sugar canes Co.453, Co.313 and Co.K41 in relation to variety, N-fertilizer treatment and period of maturity.

616 **Annual Report of S.A. Sugar Association.**
S. Afr. Sug. J. 1959 : **43** : 681–97.

Flowering was induced in varieties which only flower sporadically under Natal conditions by exposing the shoots over prolonged periods to 12½ hours day length.

617 GUILBEAU, W. F., COLL, E. E. & MARTIN, L. F.
Processing of new commercial and unreleased sugarcanes—results of clarification experiments during the 1958 season.
Sug. Bull., N. Orleans 1959 : **37** : 274–83.

A summary is given of the results of milling and clarification tests carried out in Louisiana on recently released and unreleased varieties, against CP44/101 as standard.

618 YANG, C. S., YANG, T. C. & LI, H. W.
Varietal competition in bunch planting in sugarcane breeding.
Tai Tang Tungfan/Taiwan Sug. Bull. 1959 : **6** : No. **4** : 13–21.

At the Taiwan Sugar Experiment Station, a study was made of the relative performance of varieties planted in pure stands with a single plant per stool and in mixed bunches with one plant of each of the varieties per stool. Some disparities in the ranking of the varieties as regards cane yield in the two types of planting showed that competition may occur in bunches.

619 LEU, L.-S. & BAU, Y.-S.
Resistance trial for mosaic disease of sugarcane seedling varieties in the 1958-59 crop year.
Taiwan Sug. 1959 : **6** : No. **5** : 24–27.

Information is given on the reaction of 79 seedlings when inoculated with three strains of mosaic in a trial at the Taiwan Sugar Experiment Station.

620 GRAF, A.
Zuckerrübensortenbericht, Zusammenfassung 1958. **(Report of sugar beet varieties, summary 1958).**
Flugbl. Ver. Zuckerrübenforsch. 1959 : No. 22 : unpaginated.

The results are reported of trials held in damp and dry regions of Austria. Polyploid varieties gave the best yields of roots and sugar.

621 KOSTECKI, E.
Z notatnika hodowcy buraka cukrowego. **(Notes of a sugar-beet breeder).**
Postępy Nauk Roln. 1957 : **4** : No. 5 : 99–108.

Inbreeding in sugar beet resulted in a lowering of both quantity and quality of seed and the production of coloured roots. Individual plant selection over three years, followed by crossing of the selected material, was also unsatisfactory, giving only small increases in yield and sugar content. A distant cross between a high-sugar and a tonnage variety gave 100 hybrids of which three were exceptionally high in both yield and sugar content. Crossing between genetically different partners is therefore regarded as a promising method of improvement.

622 MIRANDA DE ONÍS, J., PRIETO HERAUD, E. & BERNALDO DE QUIRÓS, A. G.
Ensayos comparativos de variedades de remolacha azucarera. **(Comparative trials of sugar-beet varieties).**
An. Inst. nac. Invest. agron., Madr. 1958 : **7** : 961–1057.

Data on root yield, sugar content and sugar yield are given for 26 varieties tested in 12 regions of Spain in 1955.

623 LJAŠČENKO, E. G.
(Testing sugar beet varieties from foreign countries).
Sahar. Svekla (Sug. Beet) 1958 : No. 11 : 42–45. [Russian].

In recent Soviet trials, only the Belgian variety HE, the German Kleinwanzleben E and the Swedish Hilleshög yielded more sugar per unit area than the Soviet standard varieties. The higher sugar yields of the foreign varieties was accounted for by higher root yields and in the case of Hilleshög also by a higher sugar content compared with such varieties as R06, R731 and V020.

624 FILUTOWICZ, A. & KUŻDOWICZ, A.
Artbastarde zwischen Zuckerrüben und *Beta patellaris* Moq. **(Interspecific hybrids between sugar beets and *B. patellaris* Moq.)**
Züchter 1959 : **29** : 179–83.

Diploid and tetraploid sugar beets were crossed with *B. patellaris* and F_1 seedlings with 27 and 36 chromosomes respectively were obtained. Most of the hybrid seedlings died because they did not develop secondary roots. Four hybrids developed normally; these differed from both their parents in form and showed various meiotic abnormalities which resulted in a high level of pollen sterility. Two hybrids with 27 chromosomes gave only 46 seed balls from which five F_2 plants were obtained. Better results came from the 36-chromosome hybrids which yielded 207 seed balls and 88 F_2 plants. The F_2 plants varied greatly in morphological and cytological characters and in their ability to survive.

625 WATSON, D. J. & WITTS, K. J.
The net assimilation rates of wild and cultivated beets,
Ann. Bot., Lond. 1959 : **23** : 431–39.

Three wild beet types and one sugar beet were harvested on each of three dates and their net assimilation rate *E* (dry weight in g./m.^{2} of leaf/week) determined for the period between the first two dates and that between the last two. Sugar beet and wild beet did not differ in *E* when *L*, the leaf area per unit area of land, was close to 1, in the first sampling interval. In the second interval, *E* decreased while *L* increased, but the relative fall of *E* was less in the sugar beet than in the wild beets. It is concluded that the development of sugar beet from its wild ancestors has not affected the intrinsic photosynthetic efficiency of the leaves but has diminished the effect of mutual interference between leaves that would otherwise occur with an increase in *L*. This change may be related to the difference in form between sugar beet and wild beet plants.

626 MANŽELEJ, I. I.
(The ways for further improvement of the productiveness of monogerm sugar beet).
Sahar. Svekla (Sug. Beet) 1958 : No. 11 : 32–38. [Russian].

Breeding monogerm varieties with improved root and sugar yields, resistant to bolting and bearing uniformly ripening highly viable seed, is discussed. Mention is made of research at the

USSR Sugar Beet Institute where a monogerm variety was found to comprise more than 10 biotypes differing in habit, size of seed and maturation, viability and initial rate of growth of the seed. All these biotypes contained up to 1·3% seed balls with two seeds.

627 ORLOVSKIJ, N. I.
(A scientific seminar on the breeding of monogerm sugar beet).
Agrobiologija (Agrobiology) 1958 : No. 6 : p. 144. [Russian].

The methods by which two Ukrainian monogerm standards were bred at Jaltuškov and Belaja Cerkov' were among the topics discussed at a seminar held in the latter place. These included intravarietal and intervarietal hybridization, repeated single plant selection and environmental training. Other subjects discussed were polyploidy, heterosis, seed production and the breeding of monogerm beet in other countries.

628 HOSOKAWA, S.
(Studies on noxious nitrogen in sugar beet).
Hokkaido Nogyo Shikenjo Hokoku/ Rep. Hokkaido agric. Exp. Sta. 1959 : No. 51 : Pp. 110. [Japanese].

Estimations have been made of the total nitrogen, protein nitrogen, soluble nitrogen, amide and amine nitrogen, phosphotungstic-acid precipitable nitrogen, sugar content and yield of a series of Japanese, European and American varieties. In general, sugar content is positively correlated with total and noxious nitrogen and negatively with yield. Noxious nitrogen can be estimated by Andrlik's method as total nitrogen—(protein nitrogen + ammonia + ½ amide nitrogen) or more easily by the colorometric method of Staněk and Palvas based on estimating the content of amine nitrogen. The results obtained by the two methods are positively correlated. Total and noxious nitrogen are also positively correlated but no consistent relationship could be discovered between noxious nitrogen and phosphotungstic-acid precipitable nitrogen.

629 ZOLOTAREV, S. N., PRESNJAKOV, P. V., DAŠEVSKIJ, L. I. & ČEBOLDA, V. F.
(Improving the sugar content of beet).
Sahar. Svekla (Sug. Beet) 1958 : No. 12 : 36–40. [Russian].

Agronomic measures designed to improve sugar yield of sugar-beet varieties are discussed. The breeding of new varieties adapted to the growing conditions of Kirgizia and resistant to diseases is also mentioned as a means of improving sugar production. Meanwhile the standard variety M2 has been superseded by R023 and F786 in the province of Frunze. R023 has a short growth period and improved sugar content and F786 yields 10 c. more roots per ha. than M2 and has a 0·5% higher sugar content. The first variety is recommended for early and the second for late digging.

630 SEVOST'JANOV, S. P. & ELECKAJA, L. K.
(An experiment on improving the productiveness of *Cercospora*-resistant forms of sugar beet).
Agrobiologija (Agrobiology) 1958 : No. 6 : 117–21. [Russian].

An account of breeding *Cercospora*-resistant forms, previously developed in the Kuban', for improved sugar yield is given [cf. XXVIII, 1962]. All the following methods proved effective: (1) direct and reciprocal crossing of resistant and high-yielding types, (2) further hybridization of hybrids thus obtained with resistant or high-yielding forms and (3) selection of resistant types from hybrids of the types high-yielding x resistant and (high-yielding x resistant) x high-yielding. Tables show that the hybrids bred by the above methods exceed the standard variety R06 in resistance, and have a higher sugar content and sugar yield per unit area; the root yields of most hybrids were a little lower than that of R06, but some hybrids were superior to it also in this respect. Some *Cercospora*-resistant forms have been crossed with varieties from Belaja Cerkov', Jaltuškov and the Sugar Beet Institute with the intention of imparting the character of monogerm seed balls to their progeny.

631 MURPHY, A. M., BENNETT, C. W. & OWEN, F. V.
Varietal reaction of sugar beets to curly top virus strain 11 under field conditions.
J. Amer. Soc. Sug. Beet Tech. 1959 : **10** : 281–82.

Varieties considered to be highly resistant to most strains of curly-top virus under natural conditions were severely damaged by Idaho strain 11 in tests at Jerome, Idaho. The desirability of using strains of known virulence in breeding for greater curly-top resistance is emphasized.

632 GIDDINGS, N. J.
The stability of sugar beet curly-top virus strains.
J. Amer. Soc. Sug. Beet Tech. 1959 : **10** : 359–63.

Several strains differing widely in virulence proved to be highly stable as regards pathogenicity when maintained in commonly cultivated varieties of sugar beet. Selection for decreased or increased virulence in successive transfers over a period of 14 months did not lead to the production of variants. Attempts to obtain variants by means of successive transfers from the rapidly advancing margins of infected areas in very young, susceptible plants also failed. The possible role of mixed infection by two or more strains in the apparent production of variants with respect to virulence is discussed.

633 Saharov, V. V., Mansurova, V. V., Platonova, R. N. & Ščerbakov, V. K.
(Obtaining polyploid sugar beet).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **128** : 1283–85. [Russian].

Germinating seed of Ramon' 931 was treated with an 0·05% aqueous solution of colchicine for 48 hr. Cytological analyses of 150 plants showed that two were tetraploid, but some of their offspring were diploid or triploid. The occurrence of these last two types is attributed either to accidental pollination or to the parents being mixoploid. A higher colchicine concentration (0·1–0·2%) and shorter treatments (2–6 hr.) might increase the number of polyploids.

634 Miège, J.
Variétés eburnéennes de manioc à lobes foliaires arrondis et nervures présentant une excroissance. **(Cassava varieties from the Ivory Coast with rounded leaf lobes and veins producing an excrescence).**
J. Agric. trop. Bot. appl. 1958 : **5** : 691–718.

Seven varieties growing on the Ivory Coast have certain characters in common which distinguish them from other cassavas grown in this region. They seem to be peculiar to West Africa and their presence is thought to indicate the existence of a secondary centre of variation of recent origin; cassava was only introduced into Africa four or five centuries ago. These varieties have rounded leaflets, which are fewer in number than those of most other varieties; also the central leaflet of each leaf is shorter than the outer leaflets. There is an outgrowth from the main vein on the underside of each leaflet. All these varieties are rather short and compact in form and very susceptible to virus diseases. A more detailed report of two of the varieties is presented. Both have a chromosome number of 36; one variety, which is male sterile, shows various meiotic abnormalities.

635 Miège, J.
La staminodie chez le manioc en Côte-d'Ivoire. **(Staminody in cassava in the Ivory Coast).**
Rev. Cytol., Paris 1959 : **20** : 161–85.

The occurrence of staminody was studied in Guebi, B7, *Manihot glaziovii* x *M. utilissima* and a population from Vassirounha, all with $2n = 36$. The respective percentages of female flowers with staminody were 56·47, 88·00, 78·52 and 85·56. The degree of development of the staminodes varied, small-grained partially functional pollen occurring more frequently in Guebi than in the other varieties. The number of staminodes was increased by dry conditions and increased with the order of branching; suppression of normal male flowers also augmented the number of staminodes.

636 Sundara Raghavan, R.
A note on some South Indian species of the genus *Dioscorea.*
Curr. Sci. 1959 : **28** : 337–38.

As the result of further investigations [cf. XXIX, 561] the author reports the following $2n$ numbers: *D. wallichii*, *D. oppositifolia*, *D. hispida*, 40; *D. tomentosa*, 40, 60; *D. pentaphylla* vars. *linnaei* and *jacquemontii*, 40; and *D. pentaphylla* var. *communis*, 80.

STIMULANTS

637 Scossiroli, R. E., Scarascia, G. T. & Wittmer, G.
Ricerche genetiche su caratteri quantitativi in *Nicotiana*. Nota I. Introduzione. Studio della variabilità e delle correlazioni fenotipiche fra caratteri. **(Genetical investigations on quantitative characters in *Nicotiana*. I. Introduction. Study of variability and of phenotypic correlations between characters).**
Tabacco, Roma 1959 : **63** : No. 690 : 25–45.

Brief descriptions are given of the cultivars used in the study, namely Virginia Bright line White Mammoth, Maryland line Catterton Medium Broadleaf and Burley GR line T645. The characters studied were plant height, leaf number, leaf dimensions and date of flowering. In White Mammoth positive correlations are reported between leaf length and breadth, leaf length and the length : breadth ratio and plant height and number of leaves; and negative correlations between plant height and leaf length and date of flowering, leaf breadth and the leaf length : breadth ratio. In Catterton only one positive correlation was established, between leaf length and breadth; there was a negative correlation between leaf length and the leaf length : breadth ratio; in material of this line reproduced in Italy there were also positive correlations between plant height and leaf number and leaf breadth and negative between leaf number and leaf breadth; these correlations did not exist in material introduced direct from the USA. In the Burley line there were positive correlations between plant height and leaf length, breadth and number and between leaf number and length : breadth ratio and time of flowering; there was negative correlation of leaf breadth and plant height with length : breadth ratio.

638 OLTVÁNYI, F. & MÓGER, J.
Debreceni dohányfajta egyes típusai értékének vizsgálata. (**Tests of the value of certain types of the tobacco variety Debrecen.**)
Dohánykut. Intéz. Közlem. 1958 : **1** : 21–29; from Hungar. agric. Rev. 1959 : **1** : p. 4.

Of four types of Debrecen tested in two localities in Hungary during 1954–57, Szomjas S–81 [Thirsty S–81] was best in both yield and quality.

Summary of Proceedings of the First Conference of Tobacco Research Workers held at Bangalore on 31st January & 1st February 1957.
Indian Cent. Tob. Comm. 1957 : Pp. 77.

639 *Radhakrishna Murty, B. Ionizing radiations in tobacco improvement.* (*pp.* 44–47).

With reference to his own research at the Indian Agricultural Research Institute, New Delhi, and to the results obtained by other investigators, the author considers (1) the possibility of improving *Nicotiana tabacum* and *N. rustica* by inducing mutation and (2) the use of radioactive pollen for tracing pollen-tube growth and for overcoming barriers to interspecific crossability by stimulating tube development. Points raised in the ensuing discussion are also summarized. One statement by the author referred to his finding that although ultraviolet treatment alone did not produce any visible chromosomal aberrations, pretreatment before X irradiation caused a considerably higher frequency of breakage than X irradiation alone. Another of his statements referred to the differential sensitivity he had observed between *N. tabacum* and *N. rustica* in respect to ionizing radiations, although the two species are alike in chromosome number and oil content of the seed. He ascribed the disparity to differential genome response. N. R. Bhat, however, questioned the validity of assuming a differential genome response when in fact different loci within a single genome may show a differential reaction. Cytoplasmic differentiation between the two species might also be involved. He suggested that it would be interesting to determine whether differences in response were shown by certain stable loci in the natural amphidiploid species and putative ancestral species.

640 *Murthy, V. N. Analysis of simple rectangular lattice designs.* (*pp.* 74–75).

A simplification of the method of analysis proposed by Nair [XXIII, 2305] for the above design is put forward.

641 *Murthy, V. N. Separation of error sums of squares in a split-plot design.* (*p.* 75).

It sometimes occurs that some treatments have markedly different variances from others. The author described a case in which it was desirable, for this reason, to resolve the error into two components in a split-plot layout.

642 GUTIERREZ, M. E.
Promising results of tobacco breeding in the Philippines.
Araneta J. Agric. 1958 : **5** : No. **3** : 20–41.

The breeding programme in the Philippines is reviewed [cf. XXVI, 1565]. Descriptions are given of the best of the new wrapper selections Comsum; the best of the new improved varieties for quality and size of leaf, Golden Simox, Harom and White Burmar; the dual-purpose variety, Golden Roman, for either filler or Virginia-type leaf; Simox F_1, for improved yield; the most wilt-resistant of the new varieties, Vizox; the most mosaic-resistant tobaccos, Simmaba 22 and Amsim; and the best new blended variety Golden Viky.

643 NÄF, U.
Studies on tumor formation in Nicotiana hybrids. I. The classification of the parents into two etiologically significant groups.
Growth 1958 : **22** : 167–80.

It is suggested that the species involved in the production of tumorous hybrids can be divided into two groups in such a way that hybrids between a species of one group with a species of the other group are tumorous, whilst hybrids within groups are nontumorous. In order to test this hypothesis, 24 hybrids were obtained amongst species each reported as being a parent of at least one interspecific tumorous hybrid. The results together with those of other investigators give information on 49 hybrids; of these 45 behave in the predicted manner. One group arbitrarily designated the plus group comprises *N. forgetiana*, *N. langsdorffii*, *N. bonariensis*, *N. sanderae*, *N. alata*, *N. longifera*, *N. plumbaginifolia* and *N. noctiflora*. The minus group includes *N. rustica*, *N. glauca*, *N. debneyi*, *N. paniculata*, *N. miersii*, *N. suaveolens*, *N. bigelovii* and *N. tabacum*. The exceptions which do not conform to the hypothesis are *N. rustica* var. *humulis* x *N. tabacum* var. *sanguinea* and *N. bigelovii* x *N. glauca* which form tumours and *N. suaveolens* x *N. plumbaginifolia* which is without tumours. However the results are thought to indicate that the hypothesis has a basis in fact and it is concluded that tumour formation is a function of two factors or factor complexes, one dependent on the minus genome and one on the plus genome.

Four of the tumorous hybrids produced are new; these are *N. rustica* x *N. forgetiana*, *N. rustica* x *N. bonariensis*, *N. suaveolens* x *N. bonariensis* and *N. suaveolens* x *N. longiflora*.

644 ROMANČUK, M. N.
(What is new in the standardization of tobacco varieties in 1959).
Tabak (Tobacco) 1959 : No. 2 : 50–52. [Russian].

Several new varieties, which are superior to previous Soviet standards in yield, quality and disease resistance, in particular resistance to root rot and bacterial leaf spot, are named.

645 KINCAID, R. R.
Magnolia, a new variety of cigar-wrapper tobacco.
Circ. Fla. agric. Exp. Sta. 1958 : No. S–103 : Pp. 6.

Magnolia has proved to be equal or superior to Rg or Dixie Shade in black-shank resistance, yield, grade index and burning performance in tests carried out at the North Florida Experiment Station, Quincy. It has also shown less susceptibility to coarse root caused by nematode than these two varieties. Magnolia was developed by crossing Rg with White Honduras and back crossing three times to Rg at intervals of three or more generations.

646 TOSKOV, N. & SPASOV, K.
(Peruštica 2, a new reliable variety (line) of the aromatic type of tobacco).
Bălg. Tjutjun (Bulg. Tobacco) : 1958 : **3** : No. 9 : 398–403 : from Ref. Bjull. bolg. naučn. Lit. (Ref. Bull. Bulg. sci. Lit.) 1959 : No. 1 : Abst. 69 : p. 44. [Bulgarian].

Peruštica 2 was selected from a Bulgarian land variety. It shows resistance to leaf spot and wind damage and is at least as productive as Kozarsko 541, while surpassing it in leaf quality.

647 BURCEV, JU. A.
(The new *Nicotiana rustica* variety Malopasynkovaja 2).
Tabak (Tobacco) 1959 : No. 2 : 52–54. [Russian].

Malopasynkovaja 2 [Few-Laterals 2] was bred at Lohvica, Ukraine. It produces only a few laterals and thereby saves labour. It outyields the standard variety Hmelovka 125C and shows improved resistance to scorching, bacterial leaf spot and tip chlorosis.

648 ROMANČUK, M. N.
(A new variety of cigarette tobacco).
Tabak (Tobacco) 1959 : No. 3 : p. 45. [Russian].

Zolotistyj Igar [Golden Igar] (Virginia Joyner x Hercegowina Puławska 3800 [Puławy Hercegovina 3800]) was bred at Puławy, Poland. It is highly productive of leaves with a pleasant light aroma, is resistant to root rot and tolerant of temperatures a few degrees below zero. Since 1959 the variety has been tested in the USSR.

649 PEENS, J. F.
Orinoco tobacco cultivated as early as sixteenth century by Spaniards.
Fmg. in S. Afr. 1959 : **35** : No. 3 : 30–32.

In this popular article the origin and chief characteristics of some flue-cured and light air-cured varieties grown in South Africa are described.

650 DALY, K.
On the origin and history of the red-flowered tobacco, *Nicotiana* x *Sanderae*.
Baileya, Ithaca 1959 : **7** : 37–41.

Comments are made on various aspects of the origin and history of the ornamental species *N. sanderae*, derived from *N. alata* x *N. forgetiana* and introduced in England in 1903.

651 Wittmer, G.
Correlazioni fra caratteri quantitativi in *Nicotiana*. I. Studio della variabilità di alcuni caratteri fiorali. (**Correlation between quantitative characters in *Nicotiana*. I. Study of the variability of some floral characters**).
Tabacco, Roma 1959 : **63** : 161–88.

Variation in seven quantitative floral characteristics was studied in plants of *N. rustica* 'Erbasanta', and *N. tabacum* 'Virginia Bright', 'Maryland' and 'Burley' grown in three different environments. Significant differences in these characters were noted between varieties in the same environment, between environments, using the same variety, and between plants within the same variety. Several of the characteristics showed consistent changes when passing from one environment to another. The respective pairs of characters (1) corolla-tube radius and length of lobe base and (2) corolla length and distance between corolla base and point where the corolla becomes ventricose were associated in all varieties and all environments. All the metric traits had high heritabilities.

652 Ligeti, L.
Nikotinban gazdag dohány szelektálására használt módszer. (**Method used in the selection of tobacco rich in nicotine**).
Dohánykut. Intéz. Közlem. 1958 : **1** : 12–15; from Hungar. agric. Rev. 1959 : **8** : p. 4.

The method used at the Budapest Tobacco Research Institute is based on the colour reaction of nicotine with brominecyan and β-naphthylamine and is used to evaluate individual plants in the field. The selected plants are allowed to produce seed under isolation and those whose leaves prove to have the highest nicotine content as determined by quantitative tests after curing are further propagated.

653 Klarner, S.
Porównanie dwóch linii krzyżówki Virginii Joyner x Hercegowina puławska 3800 z odmianami rodzicielskimi. (**Comparison of two lines from the cross Virginia Joyner x Hercegowina Puławska 3800 with the parental varieties**).
Roczn. Nauk rol. : Ser. A 1957 : **77** : 439–77.

The lines Złotolistny IHAR [Institute of Plant Breeding and Acclimatization Golden-leaved] and 7–5/42, both from the above cross, were intermediate between the parents in earliness, quality, rate of early development and plant height. In yield of dry leaves and carbohydrate content they equalled the inferior parent, Hercegowina puławska [Puławy Hercegovina]. Złotolistny IHAR was superior in protein, total N and nonprotein N to the other material tested, exceeded 7–5/42 in height and equalled the resistant variety Hercegowina puławska in reaction to *Thielaviopsis basicola*; it was lower than 7–5/42 in quality.

654 Klarner, S.
Odporność odmian tytoniu typu Kentucky na czarną zgorzel korzeniową (*Thielaviopsis basicola* Ferr.). [**Resistance of Kentucky-type tobacco varieties to black root rot (*Th. basicola* Ferr.)**].
Roczn. Nauk rol. : Ser. A 1959 : **79** : 1063–75.

Among 15 tobaccos tested in Poland during 1949–56, the most resistant were the Kentucky root-rot resistant lines 118 and 119, line 1/47 (Kentucky 3002 x Szamoszaty x Gold Leaf), line 7–5/43 (Kentucky 3002 x Szamoszaty) and Kentucky G. Moderate resistance was shown by lines 1/46, 2/46 and 3/46 (Kentucky 3002 x Szamoszaty x Kentucky 3002). The most resistant lines were poorer in quality than Kentucky 3002.

655 Ternovskij, M. F.
(**Breeding immune tobacco varieties**).
Sovet. Kuban' (Soviet Kuban'), Krasnodar 1957 : 158–68 : from Ref. Ž. (Ref. J.) 1958 : No. 11 : Abst. 47621 : 32–33. [Russian].

Trebizond 161 and Dubec 7 Alma-Ata have been obtained by interspecific hybridization involving *Nicotiana glutinosa* and back crossing to *N. tabacum*. Both varieties are resistant to *Erysiphe* and tobacco mosaic virus and outyield Trebizond 1272 and Dubec 44, the corresponding standard varieties in the Kuban', by 20–50% and 30% respectively. Mention is also made of Trebizond 295, a recent *N. tabacum* x *N. glutinosa* hybrid, which combines resistance to tobacco mosaic virus and *Thielaviopsis basicola*.

656 McLeod, A. G. & Thomson, R.
***Verticillium* wilt of tobacco. II. Field and glasshouse trials to determine resistance of varieties and species to *Verticillium dahliae* Kleb.**
NZ J. agric. Res. 1959 : **2** : 792–96.

The results of tests of 66 varieties of *Nicotiana tabacum*, 32 other *Nicotiana* spp. and hybrids from 20 crosses within *N. tabacum* are given.

The field resistance exhibited by Amarello, TI448A and Ky34 was not transferred to their hybrid progenies, suggesting that their resistance depended on multiple genes. A stage-of-growth effect and the influence of season on the incidence and intensity of symptoms constitute serious difficulties in evaluating resistance. Symptoms were never expressed until the plant had reached the flowering stage.

657 Moh, C. C. & Orbegoso, G.
Efectos de radiaciones ionizantes sobre la planta de café. **(Effects of ionizing radiations on the coffee plant).**
Café, Turrialba : undated : **1** : Pp. 46.

Five-week old seedlings of *Coffea arabica* vars. *typica* and *bourbon* subjected to 400 r. per day all died after six weeks' exposure. At 200 r., severe developmental disorders occurred and after seven weeks 50% died. At 100 r. and less the plants survived but showed such irregularities as fasciation and supernumerary vegetative buds at the nodes. Below 20 r. no significant morphological changes were noted. Irradiation of dried seeds of var. *typica* at 10,000 and 20,000 r. inhibited growth and caused chlorophyll deficiencies and abnormalities in leaf number and shape.

658 Dublin, P.
Biologie florale du *Coffea dewevrei* de Wild race *excelsa* A. Chevalier. Deuxième partie. Mégasporogénèse et étude du gamétophyte femelle. **(Floral biology of *C. dewevrei* de Wild race *excelsa* A. Chevalier. II. Megasporogenesis and a study of the female gametophyte).**
Agron. trop., Nogent 1958 : **13** : 704–31.

A detailed and illustrated account is provided of megasporogenesis and the female gametophyte. Meiosis was normal, 11 bivalents being counted. As compared with microsporogenesis, megasporogenesis appeared to be retarded and on the day when the flowers opened and pollination occurred very few ovules were ready for fertilization [cf. XXVIII, 2010].

659 **Tenth Annual Report of the Research Department of the Coffee Board, Balehonnur P.O., S. India, 1956-1957** : Bull. No. 10 : Pp. 164.

Further crosses involving local and introduced selections were effected within *Coffea arabica* with a view to developing disease-resistant, high-yielding and vigorous strains. In observation trials of advanced generations of selections and hybrids, a number of intercrosses between cultures remained free from leaf disease due to *Hemileia vastatrix*. Seedling and clonal progenies of selections in the BA series have also so far shown freedom from leaf disease.

Study of interspecific hybrids, with emphasis on *C. robusta* x *C. arabica* combinations and their back crosses and selfed progenies, continued. A coordinated project was initiated on the various interspecific hybrids with respect to cytological and morphological characteristics, yield and resistance to leaf disease. F_1 *C. robusta* 'S274' x *C. arabica* 'Kent' had $2n = 33$. In the BC_1 to Kent, 21 plants had $2n = 44$, one plant $2n = 33$ and another $2n = 55$. All four plants from the back cross to *C. robusta* had $2n = 44$. In a study of microsporogenesis in selection S450 of Kent, the regular formation of 22_{II} was observed. Rare instances of multivalent associations were however noted. In one of two *C. robusta* seedlings in which the chromosome number had been doubled by colchicine in a previous season, tetraploidy was maintained but in the other $2n$–$4n$ sectoring occurred.

Of five BC_2 plants of *C. robusta* 'S274' x Kent, three showed only very slight infection with *H. vastatrix* [cf. XXVIII, 2006]. A high proportion of plants from crosses of Devamchy hybrids and *C. arabica* selections were susceptible to this pathogen, in contrast to earlier observations of freedom from it. Two crosses with a Sudan collection as one parent continued to be free from disease.

Seedling and clonal progenies of *C. robusta* selections in the BA series are under test. Study of a wide range of species, varieties and selections from foreign countries continued.

660 **Annual Report of the West African Cocoa Research Institute 1957-58** (1959) : Pp. 77.

The following are among the investigations reported from the Tafo station:—

The main results of a further season of testing (1) Trinidad introductions, (2) clones of local selections and (3) progenies from controlled crosses are summarized. The production of further hybrids has been suspended since those under trial are giving promising results. In preparation for a future programme of hybridization, however, work is continuing on hybrids produced by crossing parents representative of individual Amazon populations, such as Nanay and Parinari, with local types and also by crossing inbreds of local types with Amazon cacao. The extent of variation between Upper Amazon varieties in the quantity of dry cocoa obtained from a given quantity of wet cocoa was determined, using the heap method of fermentation. Variation was found to be considerable, ranging from the low-conversion ratios of selections T12 and T86 to the higher ratios of pure-bred Nanay varieties.

In a study of the amount of natural pollination, evidence was obtained that wide guard rows are necessary if reasonably pure seed is to be secured. The data were derived from a plot planted with an Amelonado clone which when selfed gives on the average one albino seedling to three normal but when outcrossed produces only normal seedlings.

Whether the specimens tested were fan cuttings, seedlings or dissected beans, the Amazon type proved to be more difficult to infect with virus, using mealy bugs as vectors, than West African Amelonado.

661 Spence, J. A.
The problem of *Phytophthora palmivora* on the cocoa plant.
J. agric. Soc. Trin. Tobago 1959 : **59** : 97–111.

A Brazilian clone, S/C28, was reported to be resistant to black pod (*Ph. palmivora*) and is being used in breeding; however it has now been found to be as susceptible as ICS11 to leaf infection. Resistance has also been reported in UF clones and it has been suggested that green pods are more resistant than red pods. In Samoa, Hafi 7 appears to be less resistant than was originally thought. In Trinidad a "suggestion of resistance" has been found in SCA6.

662 Müntzing, A.
Results of field trials with cacao at hacienda Clementina, Ecuador. I. Disease resistance.
Acta agric. Scand. 1959 : **9** : 129–48.

A detailed report is presented of a study of the resistance to *Marasmius perniciosus* shown by 32 ICS clones and 18 other clones, chiefly derived from local selections at Clementina and from the Upper Amazon region. The main features of the results have already been summarized [cf. XXIX, 1848].

663 Forsøg med Sorter af Opiatvalmue 1948–1958. **(Trials of varieties of opium poppy, 1948-1958).**
Tidsskr. Frøavl 1959 : **24** : 142–43.

In these Danish trials, conducted at a number of different stations, the varieties Luna, derived from Mahndorfer, and Flora, from Mahndorfer x Peragis, both exceeded Mahndorfer in yield of seed and crude fat.

664 Sárkány, S., Dános, B. & Sárkány-Kiss, I.
Studien über Heterosiswirkung an Mohnhybriden. **(Studies on heterosis effects in poppy hybrids).**
Ann. Univ. Sci. budapest : Sect. biol. 1959 : **2** : 211–37.

Inbreeding begun in 1951 in 17 populations gave fairly uniform material by 1953, and the most productive strains were intercrossed, single-strain pollen being used in 1953 and 1954 and mixed pollen in 1955. Compared with the better parent, most of the single hybrids grew 4–10 cm. taller, flowered 2–4 days earlier and were higher in capsule and seed weight by 10–76%; morphine content was also in many cases greater in the hybrids by 7–24%. Blue seed colour proved dominant while capsule form showed a maternal influence. The hybrids from mixed pollen showed less improvement over the parents, the best being 6–32% greater in seed and capsule weight and 5–15% in morphine content. Certain strains were consistently better as parents.

665 Michalski, T.
Poliploidyzacja maku lekarskiego *Papaver somniferum* L. **(Polyploidization of the medicinal poppy *P. somniferum* L.).**
Biul. Inst. Roślin leczn. 1959 : **5** : 63–67.

Attempts to induce polyploidy by applying colchicine according to the agar method, the Schwanitz method [XX, 773] or methods involving the immersion of growing points in an aqueous solution all proved unsuccessful.

MINOR CROP PLANTS

666 Abraham, P. & Thulasidas, G.
South Indian cardamoms and their agricultural value.
ICAR Bull. 1958 : No. 29 : Pp. 27.

Part I gives the results of an extensive study of the cultivated and wild cardamoms in their natural habitats in the Western Ghats in southern India and of collections grown at the Cardamom Research Station, Singampatti. As found by earlier investigators, the cardamoms of southern India fall into two main groups: a smaller type characterized by prostrate panicles with globular or oblong fruits; and a larger type distinguished by larger leaf lamina, flexuous or erect panicles and larger, longish fruits. The two types appear to form an ecocline. It is suggested that the genus *Elettaria* represents a cenospecies, with a single ecospecies corresponding to *E. cardamomum.* This ecospecies comprises two ecotypes, i.e. the larger and smaller types, which may be respectively designated *major* and *minor.* The small ecotype may be divided into three main local populations.

Part II summarizes work on the isolation of improved strains. Seven promising cultures have been derived from single-plant selections of cardamom (*major*) from the Singampatti Hills. In yield of green fruits, they have surpassed the unselected Singampatti bulk two to five times. Selections from collections of the smaller type from the Cardamom Hills and Lower Pulneys have outyielded the Singampatti bulk one and a half to three times and almost equalled the best of the local Singampatti selections. Compared with the larger type, the smaller has the advantage of uniformity in fruit size and shape but the disadvantage of not possessing the desired dark green colour when dried.

667 POPOV, P. & HRISTOV, S.
(25 years of breeding research with sweet pepper, *Capsicum annuum* L., at the Vegetable Institute at Plovdiv).
Nauč. Trud. nauč.-izsled. Inst. zelenč. Kult. Marica (Sci. Trans. Marica sci.-res. Inst. veg. Cult.), Plovdiv 1957 : **1** : 31–58 : from Ref. Bjull. bolg. naučn. Lit. (Ref. Bull. Bulg. sci. Lit.) 1958 : No. **1** : Abst. 34 : 22–23. [Bulgarian].

Many varieties with improved yield and rich in vitamins have been obtained. Most of them were obtained by selection of Bulgarian land varieties or by crossing these with North American cultivars. Mention is made of the hybrid Kalinkov x Sivria which is characterized by early maturation and high yield.

668 PETERSON, P. A.
Linkage of fruit shape and colour genes in *Capsicum.*
Genetics 1959 : **44** : 407–19.

The linear order and map distances of the following genes in *C. annuum* were estimated as: $A - 6{\cdot}5 - O - 18{\cdot}8 - G_1$. Aa, Oo and G_1g_1 respectively govern purple *vs.* nonpurple immature fruit colour, round *vs.* elongate fruits and yellow-green *vs.* yellow immature fruit colour. In the progenies of selfed and test-crossed Oo heterozygotes, the two fruit types, round and elongated, were distinct and without intergrading. O showed complete dominance; fruit shape was also influenced by modifiers. The shape of the fruits was independent of their size and apparently depended primarily on length.

669 SWAMINATHAN, M. S., NINAN, T. & MAGOON, M. L.
Effects of virus infection on microsporogenesis and seed fertility in *Capsicum.*
Genetica 1959 : **30** : 63–69.

Healthy plants of the chilli varieties NP3, NP8 and NP46, grown at New Delhi, showed normal meiosis with 12 bivalents, while plants infected with mosaic or leaf roll showed the following irregularities: reduced chiasma frequency, formation of chromosome mosaic cells, binucleate cells and restitution nuclei, irregular anaphase separation, and the presence of monads, dyads, micronuclei and linear tetrads. In addition, pollen fertility was much reduced and seed setting was poor.

670 DELAVEAU, P.
Nouvelles recherches par chromatographie sur un cas d'amphidiploïdie chez les *Brassica.* **(New investigations by means of chromatography on a case of amphidiploidy in *Brassica*).**
CR Soc. Biol., Paris 1959 : **153** : 579–81.

Paper-chromatographic analysis of extracts of seeds of *B. juncea* and its putative parents *B. nigra* and *B. rapa* var. *sylvestris* showed that: (1) the first parent contained sinigrosin, which may be broken down to give allyl isothiocyanate, together with small quantities of a glycoside yielding phenylethyl isothiocyanate; (2) the second parent contained three glycosides giving butenyl, pentenyl and phenylethyl isothiocyanates respectively; and (3) *B. juncea* varieties contained all four types of glycosides. Samples of a mustard from Pakistan, with botanical features close to those of *B. juncea,* also yielded all four glycosides.

671 RAI, U. K.
X-ray induced high yielding - early flowering mutants in mustard (*Brassica juncea*).
Genetica 1959 : **30** : 123–28.

From an early-flowering X_1 selection, obtained from Rai 5 subjected to 25,000 r., an X_5 selection was derived which flowered two days earlier than the control and yielded 839 fruits, 27·84 g. seed and 34·79% oil, compared with the respective values 835, 27·45 g. and 33·06% in the control. Similarly, in the variety RL9, two X_4 selections from the 100,000 r. treatment and one from the 80,000 r. flowered earlier and gave more fruits and seeds than the control. X_5 selections from these all flowered three days earlier than the control and gave higher yields of seeds and of oil, selection II/3/2/9 from the 100,000 r. treatment producing twice as much oil as the control.

672 RAI, U. K.
'Thickened pods'—a morphological recessive mutant in X-ray treated *Brassica juncea.*
Sci. & Cult. 1959 : **24** : p. 534.

A mutant with thickened pods which do not shatter has been induced at the Bose Institute, Calcutta.

673 Winterkoolzaad, 1959. (**Winter rape, 1959**).
Landbouwvoorlichting **16** : Bijl. 51; Ber. Rassenkeuze 1959 : No. 268 : Pp. 2.

Data and notes on the performance of six varieties tested on different soil types in the Netherlands are given. The new varieties MPI6/52 and Mansholt's 2956 gave very good yields.

674 RUDORF, W.
Experimentell aus ihren Ursprungsarten hergestellte Rapsformen im Vergleich mit natürlichem Raps. (**A comparison of rape forms produced experimentally from their initial species with natural rape**).
Fette Seif. Anstrichmittel 1958 : **60** : 635–37.

The following methods of producing synthetic swede rapes were employed at the Max-Planck Breeding Research Institute, Köln-Vogelsang: (1) turnip rape ($2n = 20$) was crossed with cabbage ($2n = 18$) and the chromosomes of the diploid hybrid doubled; (2) *Brassica campestris* ($4n$) was crossed with kale ($4n$); (3) the diploid hybrid ($2n = 19$) of turnip rape x cabbage was directly crossed with swede rape ($2n = 38$), a number of hybrids with $2n = 38$ being obtained through the pollination of unreduced egg cells; and (4) triploid forms ($2n = 28$) were obtained by crossing $2n$ *B. campestris* with $4n$ kale. The different forms obtained differed in earliness, degree of branching and leaf shape. In four years' trials of some synthetic hybrids produced by methods (2) and (4) and crossed with Lembkes or a Polish swede rape, the hybrids equalled or exceeded Lembkes in yields of oil and seed.

675 SUKIJASOV, S. M.
(**The propagation of castor oil plants on the Zhyskij state Farm**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 6 : 52–54. [Russian].

Mention is made of local Azerbaijan varieties such as Azerbajdžan Zejtun and Baki Zejtun which are winter hardy, productive and have a high oil content.

676 ZARZYCKA, H.
Odporność niektórych odmian rącznika (*Ricinus communis*) na grzyb *Botrytis cinerea* Pers. [**The resistance of some varieties of castor oil plant (*R. communis*) to the fungus *B. cinerea* Pers.**].
Acta agrobot., Warszawa 1958 : **7** : 117–24.

Among 16 Polish and introduced varieties tested at the Reguły Plant Protection Institute near Warsaw during 1954–55, those with a more compact inflorescence were found to be the most susceptible. Puławy was the most resistant Polish variety.

677 POPOV, P. & DIMITROV, J.
(**A new cultivated variety of white sesame bred at the Sadovo Research Station**).
Nauč. Trud. visš. selskostopan. Inst. V. Kolarov (Sci. Trans V. Kolarov high. agric. Inst.), Plovdiv 1956 (1958) : **5** : 37–49 : from Ref. Bjull. bolg. naučn. Lit. (Ref. Bull. Bulg. sci. Lit.) 1959 : No. 1 : Abst. 66 : 41–42. [Bulgarian].

Belyj Sadovskij [White Sadovo] was selected from a Far-Eastern ecotype in the collection of the USSR Institute of Plant Industry. It outyields the Bulgarian variety Mestnyj Želtyj [Local Yellow] and is characterized by earliness and resistance to *Phytomonas* (*Pseudomonas*) *sesami*.

678 KOVÁČIK, A.
Vplyv medziodrodovej hybridizácie na fenologické vlastnosti u krížencov slnečnice v F_1 a F_2. (**The effect of intervarietal hybridization on the phenological characters of sunflower crosses in the F_1 and F_2 generations**).
Pol'nohospodárstvo 1959 : **4** : 491–512.

The hybrid progenies investigated tended to develop more rapidly than the parental varieties did at all stages of development. In most cases the F_2 hybrids grew more slowly than the F_1s of the same cross. All the hybrids had a shorter vegetative period than the standard Slovenská sivá [Slovak Ash-grey]. Pollen from the central part of the flower head when used alone depressed development in the F_1 but pollen from the peripheral regions of the head had the reverse effect. In the F_2 any depression disappeared, the crosses becoming more uniform in their phenological properties.

679 Merfert, W.
Ertragsstruktur und Ertragspotential bei Ölsonnenblumen. (**Yield structure and yield potential in oil sunflowers**).
Züchter 1959 : **29** : 137–43.

A method of analysing yield components is demonstrated, using data obtained from tests of varieties from Germany and the USSR. The Soviet varieties were the most promising and it is suggested that future breeding should be based on these. The results of the analysis indicated how the yield of the different varieties could be improved by suitable crosses and selection.

680 Joglekar, R. G. & Deshmukh, N. Y.
Inheritance of some characters in safflower (*Carthamus tinctorius*, Linn.).
Nagpur agric. Coll. Mag. 1958 : **32** : 11–19.

In investigations at the Agricultural Research Institute, Nagpur, India, two crosses between local varieties indicated dominance of (1) the spinous condition of the outer bracts of the capitulum over lack of spines, (2) lanceolate shape of the outer bracts over obovate to rounded and (3) smooth green inner bracts over "felted white". The three characters and floret colour [cf. XIX, 1867] are inherited independently. From their own results and those of other investigators, the authors infer that these characters of the bracts are probably governed by three separate but very closely linked factors.

681 Deshmukh, N. Y.
A note on some studies on inheritance in safflower.
Nagpur agric. Coll. Mag. 1958 : **32** : 35–36.

A cross has been made at the Agricultural Research Institute, Nagpur, with the aim of developing a variety combining the spineless condition of the bracts of the local type N29 with the large capitula, small seeds and split testa of the introduction Canada 8. Spiny bracts in this cross show dominance over spineless while lanceolate bracts are dominant over obovate to round, a 3 : 1 F_2 ratio being obtained for both characters. An association was detected between spininess and lanceolate shape and between the spineless condition and obovate to round bracts in the F_2, a previous suggestion that these characters are linked thus being confirmed [cf. 680]. In the F_1, large capitulum was dominant over small, while in the F_3 most of the plants had capitula intermediate in size between those of the parent varieties. Flowering period behaved as an intermediate character in both the F_1 and F_2.

Sixth Annual Report of the West African Institute for Oil Palm Research, 1957-1958 : Pp. 143.

682 *Sparnaaij, L. D. Plant Breeding Division. (pp. 99–102).*

An integrated programme of *tenera* x *tenera* crosses and selfings and of *dura* x *tenera* and *dura* x *dura* crosses was initiated. Breeding in which use is being made of promising progenies of Deli x *pisifera* and Deli x *tenera* was also undertaken. In addition, six palms introduced into Sierra Leone some 30 years ago and known to be productive and of good fruit composition even under adverse conditions are being used as parents. Seedlings intended for an investigation of the inheritance of fruit colour and the mantled character were planted out [cf. XXVII, 4285]. Crosses were made for the purpose of studying the inheritance of white fruits in the *albescens* type. Since it is now possible to germinate kernels from fertile *pisifera* palms, *pisifera* x *pisifera* crosses are being effected to provide material for a pure *pisifera* block. Such a planting would be valuable for genetical study of sterility in this type. Fertile *pisifera* palms have often been preferred as pollen trees for the *dura* x *pisifera* cross but there are several indications that this procedure may lead to *tenera* progenies with relatively thick shells; selfings of very thick-shelled *tenera* palms are being made in order to elucidate this question. *Corozo oleifera* (*Elaeis melanococca*) is being crossed with various types of *E. guineensis*. It is hoped to establish progenies which combine the fruit qualities of the latter species with the slow stem elongation of the former, with a view to developing palms which will enable the economic life of a plantation to be lengthened.

683 Silva, J. B. V. da
Sugestões para a aplicação ao melhoramento da *Elaeis guineensis* Jacq. de um método utilizado no melhoramento do milho. (**Suggestions for applying a method utilized in the improvement of maize to the improvement of *E. guineensis* Jacq.**).
Agros, Rio Grande do Sul 1957 : **40** : 284–87.

Various ways in which *tenera* plants can be raised from crossing suitably selected *dura* and *pisifera* lines are briefly considered.

684 Chládek, M. & Košová, V.
Blütenfasciation bei der echten Kamille (*Matricaria chamomilla* L.) II. [**Flower fasciation in chamomile (*M. chamomilla* L.) II**].
Pharmazie 1959 : **14** : 476–78.

Comparisons among (1) a small-flowered normal type, (2) a small-flowered fasciated type, (3) two normal large-flowered tetraploids and (4) five fasciated large-flowered tetraploid selections showed that the last group had the greatest mean receptacle width and included lines giving higher yields of drug and having higher contents of azulenogenic substances than the other lines. The heads of fasciated tetraploids tended to disintegrate more rapidly and they were more variable in receptacle width; the latter characteristic allows scope for further selection.

685 Neczypor, W.
Versuche zur Züchtung einer ausschliesslich bzw. vorwiegend digitoxinführenden *Digitalis purpurea* - Sorte. (**Experiments on breeding an exclusively or predominantly digitoxin-producing *D. purpurea* variety**).
Kühn-Archiv 1958 : **72** : 444–45.

Many plants originating from Germany and other countries were tested in respect of their glycoside content. No plant completely free of gitoxigenin was found but selections in which 90% of the total glycoside content is digitoxin have been obtained.

686 Laruelle, R.
L'amélioration de la culture de la valériane officinale en Belgique. (**Improvement of cultivation of *Valeriana officinalis* in Belgium**).
Ann. Gembl. 1959 : **65** : 44–57.

At Gembloux, a collection of plants assembled from various parts of the country is under observation and clonal selection is being carried out. The breeding aims are to improve yield, the content of alcoholic extract and resistance to mildew which may be caused by *Erysiphe polygoni* or *Peronospora valerianae*.

687 **Annual Report of the Rubber Research Institute of Malaya 1956** :
Pp. 79.

Nearly 1000 seedlings were obtained from hand pollinations of RRIM501 x LCB1320, PR107 x RRIM501, PR107 x RRIM623, PB5/60 x RRIM501, PB5/60 x RRIM603, PB49 x PR107 and PB49 x RRIM603 at the experiment station of the institute. Two hundred and fifty-six new clones were established from the legitimate seedlings originating from hand pollinations effected in 1954. A trial containing 100 foreign-exchange and Malayan clones was initiated at the station. Yield recording continued on the older clone and clonal-seedling trials established on estates and at the station between 1935 and 1941. The first year of tapping in the large-scale trial of clones RRIM 600 to 618 was completed at the station. Tapping was also commenced in some of the postwar estate trials of clones of the RRIM 500 and 600 series. Two of the RRIM 600 clones yielded over 900 lb. per acre during the first year of commercial tapping, 6–7 years after budding.

688 Tollenaar, D.
Rubber growing in Brazil in view of the difficulties caused by South American leaf blight (*Dothidella ulei*).
Netherlands J. agric. Sci. 1959 : **7** : 173–89.

In order to control South American leaf blight (*D. ulei*) in Brazil only resistant clones should be planted. Highly resistant clones, such as FX25, FX3844, IAN710 and IAN873, are recommended, though only limited information is available regarding their performance and secondary characteristics. Tolerant high-yielding Far Eastern clones, such as PB86 and AV1301, are also suggested, together with their selfed seedlings.

689 Sharma, A. K. & Bhattacharyya, N. K.
Chromosome studies on four different species of *Cinnamomum*.
Japan. J. Bot. 1959 : **17** : 43–54.

C. camphora, *C. zeylanicum*, *C. tamala*, and *C. iners* were all found to have $2n = 24$; 12 appears to be the basic chromosome number of this genus. Details are given of the caryotype of each species; in all cases the gross morphology of the chromosomes was similar.

690 Delhaye, R. J.
Graines de pyrèthre amélioré "HT5" à la Station de Mulungu-Tshibinda. (**Seeds of improved *Pyrethrum* "HT5" at the Mulungu-Tshibinda Station**).
Bull. INÉAC 1959 : **8** : 201–02.

The production of improved seed at Mulungu-Tshibinda is briefly described. Each seed garden contains at least six élite clones. The HT5 seed gardens contain clones selected from many crosses for their high production of flowers, pyrethrin content and resistance to *Ramularia*. Clone 4265 has a pyrethin content of 2·09%.

FRUITS AND NUTS

691 Minasjan, A. I.
(Some results of research at the Armenian Institute of Viticulture, Wine-making and Horticulture).
Agrobiologija (Agrobiology) 1958 : No. 6 : 141–43. [Russian].

Breeding with apple, pear, quince, apricot, sour cherry, peach, strawberry and vine is discussed in general terms.

692 Vasil'ev, K. V.
(At the Soči Research Station for Subtropical and Southern Fruit Culture).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 12 : 104–13. [Russian].

Breeding of southern and subtropical fruits, including *Ficus*, *Feijoa*, citrus fruits, vine, hazels, *Thea* and castor-oil plant is referred to briefly. Among the results are hybrids and seedling selections of the Unshu (= Satsuma) mandarin distinguished by high yield, winter hardiness, earliness and fruit quality.

Föreningen för Växtförädling av Fruktträd, Balsgård. Verksamhetsåret 1958.
(Association for Fruit-tree Breeding, Balsgård. Working year 1958).
1959 : Pp. 28.

693 *Nybom, N. & Bergendal, P.-O. Kärnfrukter och bärbuskar. (Pome fruits and bush fruits). (pp. 7–12).*

Besides the work referred to below, investigations on testing for hardiness and for fruit quality have been carried out. Attempts have been made to induce chromosome doubling in pollen by means of temperature shocks and *Cydonia*, *Chaenomeles*, *Sorbus domestica* and medlar have been treated with colchicine. In mutation experiments, apple, pear, plum, cherry and black currant have been subjected to various kinds of radiation treatment, and apple, pear and plum have been treated with ethyleneimine. It is noted that polyploidy affords protection only against acute radiation and not against chronic.

Apple. The almost completely anthocyanin-free variety Golden Delicious has been crossed with various red-skinned mutants with the aim of elucidating the inheritance of the red colour. Crosses made for earliness, quality and good colour include: Gyllenkrok's Astrakan x Persikerött Sommaräpple [Peach-red summer apple], Melba x Early Red Bird, Stenbock [Ibex] x Lobo and Stenbock x Gyllenkrok's Astrakan; for late ripening, good quality and attractive appearance, McIntosh x Ingrid Marie, Cortland x Lundbytorp, McIntosh x Lundbytorp, Gretorp x Spartan, Ingrid Marie x Filippa and Lobo x Spartan; for hardiness in winter apples, Lobo x Filippa and Lobo x Hangmann; and for scab resistance, Signe Tillisch, Cortland, McIntosh and Cox's Orange crossed with various scab-immune types. As the $4n$ parents in $2n$ x $4n$ combinations, tetraploid seedlings, a tetraploid Jonathan sport and a colchicine-induced tetraploid of Cox's Orange have been used; tetraploid x tetraploid crosses have also been effected. Among older crosses, Jonathan x Cox's Pomona has yielded promising seedlings, as have also Signe Tillisch x Pigeon, Stenkyrke x Wealthy and Ingrid Marie x Filippa (BM31021).

Pear. The following crosses have been carried out on a large scale: Clapp's Favourite x Colorée de Juillet, Beurré Hardy x Esperens Herre (= Seigneur d'Esperen), Esperens Herre x Conference, Clara Frijs x Pierre Corneille, Göteborgs Diamant [Gothenburg Diamond] x Beurré Giffard and Herzogin Elsa x Conference. Tetraploids of Fertility and Williams have been pollinated with the tetraploid apple seedling Ribston M2812 in the field and with the colchicine-induced tetraploid Cox's Orange 41 in the greenhouse; five full seeds were obtained. Promising material has been obtained from Robert de Neufville x Pierre Corneille, Clapp's Favourite x Conference and Johantorp x Doyenné du Comice. Some changes, probably mutational, have been observed in Williams irradiated in previous years.

Bush fruits. The development of inbred lines of raspberry and black currant continued and a number of raspberry crosses were effected. Gooseberries from crosses involving the spineless, high-quality Canadian variety Captivator are under observation.

694 *Oldén, E. J. Stenfrukter, grundstammar, jordgubbar och hassel. (Stone fruits, rootstocks, strawberries and hazel). (pp. 13–18)*

Plum. Bonne de Bry, Clyman, Jefferson, Opal, Persikeplommon [Peach plum], Reine Claude Diaphane, Reine Claude d'Oullins, Rivers Early Favourite and Victoria have been used extensively as parents. Among earlier hybrids, progenies from Reine Claude Althans included several valuable types, and Early Laxton x Ruth Gerstetter gave seedlings of interest. Other promising material was obtained from crosses involving Belgiskt Purpurplommon [Belgian Purple plum], Bonne de Bry, Early Laxton, and Reine Claude de Brahy. Progenies from the nonhardy plum Ontario were all nonhardy while those from Russian Green Gage, Reine Claude Stor Grön [Large Green gage] and Victoria were relatively hardy. The tetraploid hybrid Mount Royal x St. Anthony has given exclusively pentaploid ($2n = 40$) offspring when open pollinated, indicating that only hexaploids can effect its pollination. New octoploid seedlings have been developed from the Russian pentaploid Tern Dessertnyj [Dessert Sloe]. Crosses between hexaploids and diploids have given plants with the expected $2n = 32$. One plant from sloe x diploid plum was tetraploid while the rest were, as expected, triploid. Most plants from *Prunus fruticosa* ($4n$) x Schrecken's Bigarreau ($2n$) were triploid, but a few had higher chromosome numbers.

Cherry. Late ripening, firm flesh and resistance to disease have been the chief aims of the 67 Bigarreau crosses carried out. Among sour cherries, the Russian variety Vladimir has been crossed with Swedish varieties with a view to combining hardiness with good quality. Sour cherry was also crossed with tetraploid Bigarreau types. A hybrid ($2n = 48$) between *Prunus cerasus* and tetraploid *P. avium* set fruit after pollination partly with sweet and partly with sour cherry; the fruits resembled those of sour cherry and were sour and rather bitter in flavour. A number of hybrids from previous years have shown promise. Allmän Gulröd [Common Yellowish Red], Governor Wood, Hâtive de Berny [Berny Early], Merton Favourite and Napoleon were γ-irradiated after pollen formation in the hope of inducing self fertility; 17 fruits were obtained from self pollination of 2900 flowers.

Hazel. Crosses of hazel with filbert are under observation.

Strawberry. Parents used in crosses include Senga Sengana, Dunlap, Howard 17, Senga 54, Sparkle, Valentine and Wädenswil IV. Crosses of Senga Sengana with Blakemore, Fairfax, Finn, Huxley and Sparkle, effected in previous years, proved promising.

695 KOBEL, F.
Jahresbericht 1956/1957 der Eidg. Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil. (**Annual report for 1956-57 of the Federal Experimental Station for Viticulture and Horticulture at Wädenswil**).
Landw. Jb. Schweiz 1959 : 8 : 55–175.

In addition to the following, brief reports of trials of fruit and vegetables are given.

Apple. Many new crosses are being studied and some promising seedlings have been obtained; some of these originated from the cross Berlepsch x Oe278 (Berner Rosen x Jonathan) and others from Fraurotacher x Golden Delicious.

Cherry. Crosses have been effected with the aim of producing improved early varieties and attempts were made to culture excised embryos since these do not usually develop well in the stones of early varieties.

Soft fruits. Notes are provided on some promising raspberry crosses: Willamette x Andenken an Paul Camenzind [Souvenir of Paul Camenzind] and the reciprocal and Rote Wädenswiler [Red Wädenswil] x Willamette. The perpetual bearer Romy has been crossed with Indian Summer but the F_1 was not satisfactory. New strawberry crosses are also being investigated. The black currant Brödtorp was crossed with Wellington XXX in order to combine simultaneous fruit ripening with upright growth.

49th Annual Report of the Northern Nut Growers Association. Annual Meeting at Beltsville, Maryland, August 18 to 20, 1958 : Pp. 128.

696 *Zarger, T. G. Nut variety tests in the Tennessee valley. (pp. 39–44).*

The work of testing varieties and selections of black walnut, Chinese chestnut, filbert and pecan is surveyed.

697 *Flory, W. S. (Jun.). Species and hybrids of* Asimina *in the northern Shenandoah Valley of Virginia. (pp. 73–75).*

An inventory is given of the *Asimina* and *Annona* species and hybrids grown at the Blandy Experimental Farm, Boyce, Va., during the past 30 years. Brief notes are included on the origin and history of the collection.

698 *Graves, A. H. Hastening flowering in a chestnut seedling. (pp. 90–94).*

In view of the desirability of attempting to transfer some characters from *Castanea henryi* to *C. dentata*, the hastening of flowering in seedlings of the former species by bark ringing is described. The pollen was functional. The method therefore facilitates the use of *C. henryi* as ♂ parent.

699 BORDEIANU, T. & COCIU, V.
Noi succese în dezvoltarea creatoare a învăţăturii Miciuriniste. (**New successes in creative development following Mičurinist teaching**).
An. Romîno-Soviet. : Ser. Agric. 1956 : No. 3 : 115–27.

Recent Soviet work on fruit breeding along Mičurinist lines is reviewed.

700 Draczynski, M.
Der zeitliche Verlauf der Pollendifferenzierung bei Mandel, Pfirsich und Aprikose und der Einfluss der Knospentemperaturen auf diese Vorgänge. (**The course of pollen differentiation in time in almond, peach and apricot and the influence of bud temperatures on these processes**).
Gartenbauwiss. 1958 : **23** : 327–41.

The time when pollen differentiation was completed was determined for 18 almond varieties, 75 peach varieties and 28 apricots. The earliest group of almonds had ripe pollen in the middle of November and the latest group at the beginning of the following February. Early pollen differentiation was correlated with early flowering. One of the peach varieties, Goldkugel [Gold Ball], had ripe pollen at the end of December whilst in three other groups the pollen matured between the beginning of February and the end of March. The apricots consisted of three groups which showed archesporia in the first part of December, at the end of December or at the beginning of February; pollen differentiation was not completed until the following February or March.

701 Kemmer, E. & Steckel, W.
Über den Zusammenhang zwischen Blüte, Ansatz und Ertrag bei Kernobst. (**On the relation between blossom, set and yield in pome fruit**).
Erwerbsobstbau 1959 : **1** : 90–95.

Counts were made of the flowers and fruits on individual trees of 40 apple varieties and four pears on successive dates during 1957 and 1958. Flowers of Adersleber, Laxton's Superb, Golden Pearmain, Landsberg, Golden Delicious, Weisser Klar [White Clear] and Allington were resistant to frost during 1957. The number of flowers in an inflorescence was found to be a varietal character. Varieties were classified into three groups according to the number of fruit per inflorescence. On the whole the varieties tending to have several fruit per inflorescence were the best yielders. The number of flowers per inflorescence varied over a similar range in varieties yielding one fruit per inflorescence and in varieties with more fruit.

702 Schaer, E.
Der Jonathan und seine Nachkommen. (**Jonathan and its progeny**).
Schweiz. Z. Obst- u. Weinb. 1959 : **68** : 353–55.

American, Netherlands and Japanese varieties with Jonathan as either male or female parent are listed. Those tested in Switzerland all have a number of good characters but none meets all the requirements of Swiss growers and consumers. Crosses of Jonathan carried out in Switzerland have also failed to yield fully satisfactory varieties but a number of American mutants of Jonathan have shown promise.

703 (**The apple variety Oranževoe**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 6 : p. 61. [Russian].

Oranževoe [Orange] (Borovinka x Renet Simirenko [Simirenko's Reinette]) was bred at Mičurinsk. It is winter hardy, resistant to scab and late in ripening. The fruits have a pleasant flavour, with an individual weight of 130–150 g. or even 200 g., and keep until March.

704 Ritter, C. M., Hitz, C. W. & Hewetson, F. N.
Some promising new apple varieties.
Sci. Fmr., Pa. 1959 : **7** : No. **1** : p. 6.

A brief description of the variety Melrose is included in this review of new varieties. Melrose, from Jonathan x Delicious, has good-sized and attractively coloured fruit, with satisfactory dessert and processing qualities, and it keeps well. It flowers at the same time as the variety Rome and ripens with Early Stayman.

705 Dana, M. N. & Klingbeil, G. C.
Apple varieties for Wisconsin.
Fruit Var. hort. Dig. 1959 : **13** : 57–58.

Descriptive notes on seven varieties considered worthy of extended trial in some areas of Wisconsin are provided.

706 Potapov, S. P. & Potapova, V. V.
(**Varetal trials of apples**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 6 : 42–44. [Russian].

Pobeda Petrova [Petrov's Victory] (Antonovka Obyknovennaja [Common Antonovka] x Borovinka), a new winter-hardy variety from the Moscow Horticultural Research Station, outyielded all others in the trial at Kolomna, Moscow province. Other new varieties also bred at Moscow, mentioned for hardiness and high yield, are Arkad Novyj [New Arkad] (Borovinka x Arkad Želtyj [Yellow Arkad]) and Desertnoe Petrova [Petrov Dessert] (Koričnoe Polosatoe [Brown Striped] x White Winter Calville). Arkad Novyj is the earliest of the new varieties and Pobeda Petrova the latest.

707 Benko, B.
Hospodárenie jabloní s vodou. **(The water economy of apple trees).**
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1959 : **32** : 671–80.

A preliminary report is made of observations on the transpiration of some apple varieties; Arland's method and another method involving the use of cobalt paper were used for measuring transpiration.

708 Sax, K.
The cytogenetics of facultative apomixis in *Malus* species.
J. Arnold Arbor. 1959 : **40** : 289–97.

The facultative apomicts *M. hupehensis*, *M. toringoides*, *M. sikkimensis* and *M. sargentii* var. *rosea* proved to be triploid while *M. rockii*, *M. toringoides* var. *macrocarpa* and *M. sargentii*, also facultative apomicts, were tetraploid. Cytological data on seedlings from open pollination and on progenies from controlled crosses of *M. sargentii* and var. *rosea* with sexual diploids showed that the triploid species produce maternal triploids and occasional tetraploids, and the tetraploid species maternal tetraploids and hybrid triploids and pentaploids. Facultative apomixis was a dominant trait in the F_1 hybrids from the controlled crosses.

709 Kemmer, E.
Über die Anfangsentwicklung von Standbäumen selbstbewurzelter Apfelsorten. **(On the initial development of standard trees of self-rooted apple varieties).**
Erwerbsobstbau 1959 : **1** : 54–57.

At Berlin-Dahlem, 25 varieties growing on their own roots were tested and classified according to vigour. The most vigorous varieties gave the best yields. Šafran Kitajka [Saffron Chinese Crab], Golden Delicious, Oldenburg, Allington, Landsberg and James Grieve gave particularly high yields. For six varieties a comparison was made between their performances when grafted on rootstock IX and when grown on their own roots.

710 Naumov, V. A.
(Vegetative segregation in hybrid apple seedlings).
Agrobiologija (Agrobiology) 1958 : No. **6** : 68–74. [Russian].

The variability of the shape of leaves and fruits in seedlings of Bergamotte Reinette x Bel'fler Želtyj [Yellow Bellflower] was investigated [cf. XXIX, 4338]. The biometrical values for seedlings and the parent varieties showed that variability in respect of leaf shape of all seedlings, except seedlings 8–23–2 and 8–24–8, was no greater than that of the parent varieties. The variability in fruit shape of the seedlings however was greater. This was specially observed at the fruit base where some fruits had a cavity while others had a swelling or various recombinations of these two characteristics. The highest degree of variability in respect of fruit shape was observed in seedling 8–26–14, which produced, in addition to fruits with cavities or swellings, stalks of varying length, thickness and shape. This seedling continued to give vegetative segregates in the succeeding years.

711 Neumann, D.
Die Wuchs- und Ertragsleistung von Apfelsorten im VE- Lehr- und Versuchsgut Eschenhörn. **(The growth and yield performance of apple varieties in the State Teaching and Experimental Establishment, Eschenhörn).**
Arch. Gartenb. 1959 : **7** : 195–207.

Tabulated data are provided on crown measurements, average yield during 1952–1957 and the tendency to alternate bearing of 69 scion-rootstock combinations; MXI was the rootstock most commonly used. A correlation of $r = + 0{\cdot}42$ was found between crown volume and the average yield for the six years.

712 Lebedev, A. I.
(The progress in horticulture in the Primor'e territory).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. **6** : 29–31. [Russian].

Varieties of apple, pear, apricot, plum, raspberry, black currant, gooseberry, strawberry and grapes adapted to cultivation in the Far East are listed. Most are hardy land varieties or introduced material long in cultivation. Worth mention are the local apricots Eloveckogo [Eloveckij's], Samyj Severnyj [Northernmost] and Sedanskij, which ripen before 15 August, and the new large-fruited apple Primor'e, which overwinters without screens when grown in a sheltered position.

713 Braun, H. & Nienhaus, F.
Fortgeführte Untersuchungen über die Kragenfäule des Apfels (*Phytophthora cactorum*). **[Continued investigations on fruit rot of apple (*Ph. cactorum*)].**
Phytopath. Z. 1959 : **36** : 169–208.

Of the 15 varieties examined in two severely infected plantations, Boskoop, Red Boskoop, Golden Pearmain and Moselgold, all grafted on

EMIX, Oldenbury and Zuccalmaglio on EMII, Champagner Reinette [Champagne Reinette] on EMXI and Deutscher Edelapfel [German Noble apple] on an unknown rootstock were found to be completely free of disease. After artificial infection the fruits of 30 varieties were all severely attacked. Also all the EM rootstocks, with the exception of IV and IX, became diseased after artificial infection. Susceptibility to *Ph. cactorum* was found to increase with age. Samples of the pathogen collected from different varieties differed in their pathogenicity.

714 TARANOVA, E.
(The inheritance of resistance to scab in hybrid apple seedlings).
Latv. PSR Zinãt. Akad. Vestis 1958 : No. 8 : 51–56. [Russian].

Sejanec Trebu [Trebu Seedling], Wealthy, Pepin Šafrannyj [Saffron Pippin], Antonovka 600 g., Osennee Polosatoe [Autumn Striped] and Borsdorf were the most resistant among varieties tested in Latvia, and hybrids from crosses between these gave predominantly resistant progeny.

715 DAYTON, D. F.
Progress in breeding scab-immune apples.
Trans. Ill. hort. Soc. 1958 : **92** : 54–56.

An outline is given of the project of breeding for scab immunity initiated at the Illinois Agricultural Experiment Station in 1946. Material at the most advanced stage of breeding and from which encouraging results are being obtained consists of seedlings involving (1) *Malus floribunda*, (2) a "Russian seedling" or (3) *M. prunifolia* in their pedigrees as the source of immunity [cf. XXVI, 645]. According to one year's observations, a seedling from McIntosh x (Wealthy x Russian seedling) is especially promising as regards several horticultural requirements.

716 NYBOM, N.
Gloeosporium—en växtförädlingsfråga? **(*Gloeosporium*—a plant breeding problem ?)**
Fruktodlaren 1959 : **30** : 71–73.

In tests in which the fruits of a number of apple varieties were inoculated with spores of *G. perennans*, Ingrid Marie, Cox's Orange, McIntosh and Lord Lambourne proved susceptible while Jonathan, Oretorpsrenett [Oretorp Reinette] and Lundbytorp remained free from infection. Mycelial inoculations of the first-year shoots of 27 varieties resulted in infection in most of the varieties but Kingston Black, Antonovka, Delicious, Atlas and Macoun were more or less free from attack. Resistance to branch infection is regarded as probably more useful than resistance to fruit infection, and for this reason the last three varieties, which are good in quality, are expected to be of use in breeding.

717 OVERCASH, J. P. & MURPHY, B. C.
Apple varieties react differently to mild winters.
Miss. Fm. Res. 1959 : **22** : p. 5.

The development of apple varieties at Newton, Mississippi, after the very mild winter of 1956–57 was observed. Trees of Anoka, Hackworth, Kosciusko and Transcendent Crab were least affected by the mild winter and appear to have a low chilling requirement. Carlton, Cauley, Early Harvest and Improved Winesap reached full bloom four to seven weeks later than usual.

718 VITTRUP CHRISTENSEN, J. & MOLLS RASMUSSEN, P.
Orienterende sortsforsøg med pærer. **(Preliminary varietal trials with pears).**
Tidsskr. Planteavl 1959 : **63** : 134–72.

Data on the picking date, yield, size of fruit and storage quality are given for 46 varieties tested in Denmark during 1950–57. Fifteen gave satisfactory results.

719 TERPÓ, A.
A Pyrus genus félkultúr és kultúr alakjainak természetes előfordulásai. **(Natural occurrence of the semi-cultivated and cultivated forms of *Pyrus*).**
Kertész. szőlész. Főiskol. Évköny. 1957 : **4** : Pp. 30.

TERPÓ, A.
Magyarország vadkörtéi. **(The wild pears of Hungary).**
Diss. Budapest bot. Inst. 1958 : Pp. 352 : from Hungar. agric. Rev. 1959 : No. 2 : p. 5. (Abst.).

Pears growing under natural conditions in Hungary fall into the following categories: (1) true wild pears, including the new species *Pyrus magyarica*, *P. praenorica*, *P. mecsekensis* and *P. decaisneana* and the species *P. pannonica*, *P. transdanubica*, *P. hazslinszkyana* and *P. mohacsiana* which are of hybrid origin; (2) cultivated pears which have reverted to the wild, including (*a*) escaped cultivated varieties which breed true, e.g. Doyenné Blanc [White Doyenné] and Williams Christbirne [William's Bon Chrétien] and (*b*) hybrids between cultivated varieties and wild species; and (3) wild pears which are in the process of becoming domesticated. Hybrids of group (2*b*) from crosses of cultivated pears with *P. pyraster* are referred to as *P. amphigenea* and several of these are described in the first paper.

Four sections of the genus are distinguished: (1) *Pashia*, including species regarded as relicts derived from an ancient species originally covering western Asia, Europe and North Africa; (2) *Achras*, comprising the species *P. pyraster*; (3) *Xeropyrenia*, which contains the most drought-resistant species, including *P. syriaca*; and (4) *Argyromalon*, the most frequent Hungarian representative of which is *P. nivalis* var. *orientalis*. The latter crosses readily with *P. pyraster*, the hybrids being designated as *P. pannonica*. *P. austriaca* is also stated to be derived from *P. nivalis* and *P. pyraster*. *P. praenorica*, from *P. austriaca* x *P. pyraster*, forms a stabilized intermediate species, while nonstabilized hybrids from the same cross are described as *P. transdanubica*.

720 MORETTINI, A.
William precoce Morettini (William x Citron des Carmes 12/II). [**Morettini's Early William (William x Citron des Carmes 12/II)**].
Ital. agric. 1959 : **96** : 747–55.

The above pear variety is characterized by large greenish fruits with melting flesh. Maturity is reached early, after Coscia but before Dr. J Guyot or Clapp's Favourite.

721 KISIL', S. E.
(A remarkable pear variety).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. **6** : p. 72. [Russian].

Osennjaja Jakovleva [Autumn Jakovlev] exceeds Margarieta Maril'ja in hardiness and equals it in yield and fruit size and quality. It has thin skin, sweet juicy flesh with a pleasant aroma and transports well.

722 BECK, J.
Search continues for disease resistant pear.
Report, Lafayette, Ind. 1958 : **1** : No. **3** : 6–7.

As fire blight (*Erwinia amylovora*) is now making the growing of pears uneconomical in Indiana, attempts are being made to produce resistant varieties by crossing locally grown high-quality but susceptible varieties, such as Bartlett, Clapp's Favourite and Comice, with selections derived from the oriental species *Pyrus ussuriensis*. This species is vigorous, winter hardy and resistant to fire blight and leaf spot (*Fabraea maculata*) but of inferior quality. Some success has been achieved but further work is needed to produce a highly resistant and good-quality variety.

723 ZALESKI, K., WIERSZYŁŁOWSKI, J. & REBANDEL, Z.
Obserwacje i doświadczenia nad brunatną plamistością liści grusz (*Fabraea maculata* Atk., *Entomosporium maculatum* Lev.) jej biologią i zwalczaniem na siewkach w okresie produkcji szkółkarskiej (z lat 1948–1954). [**Observations and experiments on leaf blight of pear (*F. maculata* Atk., *E. maculatum* Lev.) and its biology and control in seedlings during nursery production (from 1948 to 1954)**].
Poznań. Towarz. Przyjaciół Nauk Wydział mat.-przyrod. Prace kom. Nauk roln. leśn. 1959 : **5** : No. **1** : Pp. 46.

When artificially inoculated, *Pyrus caucasica* proved the most resistant nursery stock tested at the Agricultural College of Poznań, resistance being greater in the three-year old than in the two-year old seedlings. Intermediate resistance was shown by *P. salicifolia* x *P. communis* and *P. elaeagrifolia* x *P. communis*, while *P. communis* seedlings were the most susceptible.

724 RODRÍGUEZ, C. & HERAS, L.
Clorosis calcárea de membrilleros en relación con el ataque por *Entomosporium maculatum* Lev. (**Calcium-induced chlorosis in quinces in relation to attack by *E. maculatum* Lev.**).
An. Estac. exp. Aula Dei 1959 : **6** : 106–09.

Among eight quince varieties, those most resistant to lime-induced chlorosis were least susceptible to attack by *E. maculatum* (*Fabraea maculata*).

725 SOMOROWSKI, K.
Problem uprawy i hodowli moreli. (**The problem of apricot cultivation and breeding**).
Postępy Nauk Roln. 1958 : **5** : No. **5** : 85–96.

Requirements for apricot breeding in Poland include hardiness under severe winters and resistance to late frosts. To this end varieties cultivated in Poland are to be crossed with species from central Asia and the Far East.

726 OLSEN, K. L. & SCHOMER, H. A.
Quality studies of Blenril and Earliril apricots.
Proc. Wash. St. hort. Ass. 1958 : **54** : 195–96.

After 10 days in storage at 36° F. followed by a ripening period at 65° F., the new varieties

Blenril and Earliril [cf. XXVIII, 884] were superior to Wenatchee, as judged by uniformity in ripening, colour, texture, flavour and edibility.

727 DERMINE, E.
Étude des variétés de pruniers "Quetsche Commune" et "Reine-Claude verte" en vue de la recherche de sous-types intéressants. **(A study of the plum varieties "Quetsche Commune" and "Reine-Claude verte" with a view to finding interesting subtypes).**
Rev. Agric., Brux. 1959 : **12** : 295–97.

In the Namur province of Belgium, considerable variation in flower and fruit characters was found in the two varieties Quetsche Commune and Reine Claude verte [Green gage]. Stocks with superior characters have been selected and are being tested.

728 OLDÉN, E. J.
Några synpunkter på en bra plommonsort. **(Some views on a good plum variety).**
Fruktodlaren 1959 : **30** : 97–99.

A discussion of the characteristics of the chief plum varieties grown in Sweden is followed by a brief account of the breeding aims at the Balsgård fruit breeding institute. Mention is made of a promising new variety from Ontario x Ruth Gerstetter; it has a tough, bluish-purple skin and juicy flesh without the astringency of Ruth Gerstetter.

729 SHEPARD, P. H.
The Ozark Premier plum.
Fruit. Var. hort. Dig. 1959 : **13** : p. 53.

Ozark Premier, developed from a cross of Burbank with Methley, has large red-skinned fruit with sweet, yellow, fine-grained flesh. It ripens in Missouri about 1 August and requires three to four pickings. It keeps and transports well. The tree appears to be resistant to bacterial spot and black knot. The flowers are not completely self sterile but pollination by another Japanese variety greatly increases the yield.

730 MURAWSKI, H.
Beiträge zur Züchtungsforschung an Pflaumen. **(Contributions to breeding research on plums).**
Kühn-Archiv 1958 : **72** : 443–44.

Seedlings of *Prunus cerasifera* originating from Turkey have been under observation at Müncheberg for several years. The morphological, pomological and phenological characters of the seedlings showed considerable variation and some of the seedlings have produced fruit suitable for fresh consumption and other uses. Tetraploids complete their vegetative period earlier than the diploids. Frost-resistant seedlings have been found and some of these can be vegetatively propagated and are suitable for use as rootstocks. In polyploid seedlings tetrad formation is disturbed and the irregular pollen has low germinating capacity. Tetraploids were found to be self sterile and after pollination by diploids and tetraploid *P. spinosa* no seed was set. Hybrids of *P. cerasifera* x *P. spinosa* are being investigated; in morphological characters, they are intermediate between the parent forms. They have 26 chromosomes and are completely sterile.

731 FUNK, T.
Vorarbeiten zur Unterlagenbereinigung bei *Prunus mahaleb* durch Überprüfung der Möglichkeiten der vegetativen Vermehrung und der Einkreuzung von Sauerkirschen. **(Preliminary work on rootstock improvement in *P. mahaleb* by examination of the possibilities of vegetative propagation and of crossing with sour cherries).**
Kühn-Archiv 1958 : **72** : 441–43.

The cross *P. mahaleb* x *P. cerasus* and the reciprocal resulted in a very low fruit set; the hybrid mostly resembled *P. mahaleb*. Of the *P. mahaleb* trees investigated, only 5% were fully self fertile; various degrees of partial self fertility were found. Progenies of individual trees varied considerably in morphological characters and vigour. In many cases the influence of the mother tree on the characters of the progeny was quite clear. Some mother trees gave very uniform progeny. No relationships were found between colour and form of the stone and germinating capacity.

732 SCARAMUZZI, F.
Dalla Turchia, quattro cultivar di ciliegio acido. **(Four cultivars of sour cherry from Turkey).**
Frutticoltura, Bologna 1959 : **21** : 269–80.

Four of the best Turkish cultivars tested in Italy are described, data being given on such features as time of flowering at Florence, self and cross compatibility and composition of fruit, in addition to the main morphological characters. They all have large fruits of low acidity.

733 Dickson, G. H.
Three new sweet cherry varieties from Canada.
Fruit Var. hort. Dig. 1959 : **13** : p. 61.

Three new varieties have been released in Ontario. Vista (35031), from Hedelfingen x Victor, is a large, dark, firm cherry with an attractive appearance but is subject to some cracking. Venus (35042), from Hedelfingen x Windsor, matures about five days later than Vista and has large shiny-black fruit of high quality. It has shown a tendency to overset with a consequent reduction in fruit size. Vic(27026), from Bing x Schmidt, matures about the same time as Windsor but the fruit is superior in size and of darker colour; the quality is good. Vic is better than Windsor for canning and is satisfactory for freezing and making maraschino. The trees are large and consistently heavy bearers.

734 Zielinski, Q. B., Sistrunk, W. A. & Mellenthin, W. M.
Sweet cherries for Oregon.
Sta. Bull. Ore. agric. Exp. Sta. 1959 : No. 570 : Pp. 19.

Twenty-one varieties which are considered to be the most promising of the many tested at the Oregon Agricultural Experiment Station are described. Information on flowering and harvest dates, pollination and fruit characters, including the quality of fresh and processed fruit, is provided.

735 Talejsnik, E.
(*Prunus tomentosa* in the Primor'e territory).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 5 : 49–50. [Russian].

Seedlings of *P. tomentosa* were selected at the Gorno-Taežnaja Research Station, Ussurijsk. They are highly productive of large fruits and their flavour is good. Seedling 8–7, which is referred to as one of the best, yielded 14 kg. in 1958. Its fruits weigh 2·5 g. each, have a sugar content of 10·2% and ripen in July–August.

736 Gilbert, F. A.
Winter injury to sweet cherry blossoms.
Fruit Var. hort. Dig. 1959 : **13** : p. 52.

Results of a comparative study of the blossom-bud hardiness of ten varieties are tabulated. Schmidt proved to be least hardy and Windsor and Bing the hardiest of the varieties tested.

737 Anzin, B. N.
(Winter injury to cherry buds).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 5 : 47–49. [Russian].

Mention is made of sour cherry varieties resistant to frost injury to buds in the Central Belt of the USSR. They were bred at Mičurinsk, Kujbyšev, Sverdlovsk and Leningrad and derive resistance from *Prunus fruticosa*.

738 **(The sour cherry variety Tambovčanka).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 6 : 61–62. [Russian].

Tambovčanka [sour cherry from Tambov] (Vladimir x Ljubskaja) was bred at Voronež. It has large dark fruits with firm juicy flesh of pleasant flavour. It crops abundantly and is at least as winter hardy as Vladimir.

739 Brauns, M.
Beiträge zur Züchtung moniliaresistenter Sauerkirschen. I. Mitteilung über Infektionsversuche mit *Sclerotinia laxa* Aderh. et Ruhl. und *Sclerotinia fructigena* Schroet. an Sauerkirschsorten. **(Contributions to the breeding of sour cherries resistant to *Monilia*. I. Information on infection tests with *S. laxa* Aderh. et Ruhl. and *S. fructigena* Schroet. on sour cherry varieties).**
Züchter 1959 : **29** : 143–49.

Seven sour-cherry varieties were tested during the time of full bloom with three samples of *S. laxa* and one of *S. fructigena* coming from different host plants. Branches and flowers were infected in the field and also flowers on cut branches were infected in the greenhouse; the infection of branches in the open proved to be the most satisfactory method. The five dark cherries tested were susceptible, Schattenmorelle being the most susceptible. Podbielski showed some resistance and Grosser Gobet [Large Gobet] was the most resistant. The samples of *Sclerotinia* varied in their virulence on different varieties.

740 Watson, W. W.
Good production in Delta peach variety tests.
Miss. Fm. Res. 1959 : **22** : p. 8.

Yield data for 10 varieties tested during 1956–1958 at the Delta Branch Experiment Station, Miss., are presented. Georgia Belle produced the highest three-year yield per tree and per acre. Information on the characteristics of these and other varieties is provided.

741 Kramer, S.
Beiträge zur Züchtungsforschung beim Pfirsich. II. Morphologische und physiologische Untersuchungen an Pfirsichsorten *Prunus persica* (L.) unter besonderer Berücksichtigung der "kernechten" Sorten. [**Contributions to breeding research with peach. II. Morphological and physiological investigations on peach varieties *P. persica* L., with special reference to "true-breeding" varieties**].
Arch. Gartenb. 1959 : **7** : 112–54.

Seedlings of the true-breeding varieties Proskau and Kernechter vom Vorgebirge [Foothill True-breeding] and some clonal varieties were studied. Measurements were made of the dimensions of leaves, buds, stones and fruit; each character showed a specific variability independent of the variety. Some correlation was found between the dimensions of a given organ. Fruit and stone dimensions appeared to be most useful for differentiating and evaluating varieties. In all the characters studied the seedlings showed a greater range of variation than the grafted clonal varieties. No correlation was found between date of flowering and date of ripening or between the times of ripening and leaf fall. The number of fruit produced was more closely correlated with the yield than the fruit weight. Also the rate of growth was correlated with yield. Different parts of the trees differed in their susceptibility to frost and the seedling varieties were more resistant than the clonal varieties. These seedling varieties are thought to be useful breeding material; the Proskau population shows most promise for the selection of early types. Already a seedling combining good flavour, high yield and frost resistance has been selected.

742 Harrison, T. B.
Garnet Beauty—an early mutation of Redhaven peach.
Fruit. Var. hort. Dig. 1959 : **13** : 55–56.

Garnet Beauty is early maturing and yields medium to large size fruit with very little pubescence; the skin is coloured bright red over yellow and the yellow flesh is streaked with red, firm, but melting and of good flavour. The fruit is freestone when mature and will hang on the tree until overripe. Trees of Garnet Beauty are above average in vigour and have produced heavy crops in their third year. Garnet Beauty is self fertile. It is slightly susceptible to *Xanthomonas pruni*.

743 Hinrichs, H. A.
The Goldenred peach.
Fruit. Var. hort. Dig. 1959 : **13** : p. 54.

This attractive variety is a cross between Early Elberta and Halehaven and is vigorous and productive [cf. XXIX, 673].

744 **Carol, a hardy peach.**
Fruit Var. hort. Dig. 1959 : **13** : p. 60.

Carol, a hardy, open-pollinated seedling of the variety Tremmel, has large, yellow, well-flavoured fruits which are good for tinning and freezing.

745 **Comanche peach.**
Fruit Var. hort. Dig. 1959 : **13** : p. 60.

This new variety, from Vedette x Halehaven, has been released by Illinois Agricultural Experiment Station. The tree is vigorous, winter hardy, moderately resistant to bacterial spot (*Xanthomonas pruni*) and yields well, the fruit maturing about three days before Redhaven in southern Illinois. It is self fertile with reniform foliar glands. The good quality fruit has yellow flesh of a firm, medium texture and a reddish skin.

746 Carlone, R.
Influenza delle gibberelline sullo sviluppo dei germogli e dei frutti di alcune cultivar di pesco. (**The influence of the gibberellins on the development of the buds and fruits of some peach cultivars**).
Frutticoltura, Bologna 1959 : **21** : 353–62.

The effects of a mixture of gibberellin A and gibberellic acid on the buds and fruits of the three varieties Aurora, J. H. Hale and Michelino are reported. Shoot development was promoted most noticeably in Michelino. Fruit size was also increased, J. H. Hale showing the most marked response. However, increase in fruit size was offset by local destruction of the indumentum and its replacement by unsightly rough patches.

747 Oberle, G. D. & Moore, R. C.
Redbud and Lexington, two new varieties of nectarine.
Fruit Var. hort. Dig. 1959 : **13** : p. 50.

[Cf. XXIX, 4321].

748 Marloth, R. H. & Basson, W. J.
Relative performance of Washington Navel orange selections and other navel varieties.
J. hort. Sci. 1959 : **34** : 133–41.

Information is provided on the growth, yield and fruit quality of four strains of Washington

Navel and three other varieties studied at Alkmaar in the Eastern Transvaal and at Baddaford in Eastern Cape Province over a number of years. Robertson Navel trees and fruit were the smallest and their yield was less than that of the other selections. Company and Pretoria Navel trees were the largest and the four Washington strains did not differ in size. Company and Pretoria Navels had thinner rinds, higher juice contents, less total soluble solids and more acid than the other selections. Robertson Navel had a thinner rind, more total soluble solids and sometimes more juice than the Washington strains. Robertson Navel matured early and Company and Pretoria Navels matured late. Company and Pretoria Navels tended to have one or two seeds in most of their fruits and one of the Washington strains averaged one seed in 10 fruits; the other selections were seedless. The locality influenced the performance of these trees.

749 GLAZYRIN, V. A.
(The clonal selection of the Unshu mandarin).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 6 : 51–52. [Russian].

An account of selection of high-yielding and winter-hardy clones of the Unshu (= Satsuma) mandarin conducted by the Soči Research Station in the Adler district of Krasnodar territory is given. The results include 6G1, 14A10 and 93, interesting for their combination of high yield, early maturity and good overwintering ability.

750 HARDING, P. R.
Biphenyl-induced variations in citrus blue mold.
Plant Dis. Reptr. 1959 : **43** : 649–53.

Strains of *Penicillium italicum* resistant to high concentrations of biphenyl have been induced by exposure to this substance for a few weeks. The changes were sudden, constant and permanent and evidently due to genetic mutation, but it is not known whether these were spontaneous or induced. In no case was there any decline in virulence when the mutant forms were inoculated into lemons.

751 BIANCHEDI, A.
Gelsi nostrani e Kokusò pronti in primavera. **(Our own and the Kokuso mulberries available in the spring).**
G. Agric. 1958 : **68** : p. 482.

The Japanese varieties Kokuso 20, 21 and 27 [National mulberry 20, 21 and 27] are being distributed in Italy. In favourable localities, they greatly exceed Morettiano in foliage production. [Cf. XXVIII, 4657].

752 JARRETT, F. M.
Studies in *Artocarpus* and allied genera, III. A revision of *Artocarpus* subgenus *Artocarpus*.
J. Arnold Arbor. 1959 : **40** : 298–326.

A further instalment in this series of papers provides a detailed classification of *Artocarpus* spp. [XXIX, 3059]. The part dealing with *A. communis* includes a discussion of genetical aspects of the seedless condition and of variation in the seeded and seedless forms. It is emphasized that the possible role of triploidy as the chief cause of the failure to produce seeds requires investigation.

753 GOPALKRISHNA, N. & KHANDUJA, S. D.
Lucknow 49, a promising variety of guava for Western India.
Poona agric. Coll. Mag. 1959 : **49** : 251–53.

Lucknow-49, regarded as the most promising variety for western India, is described. It was selected at the Ganeshkhind Fruit Experiment Station, Poona.

754 SAMARINA, A. P.
(Kaki).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 6 : 49–50. [Russian].

Nine varieties of *Diospyros kaki* were chosen for their economic worth from the collection of the Suhumi Research Station of the Institute of Plant Industry. They included Zendži Maru, which is regarded as a good pollinator for most varieties.

755 EYNARD, I.
La coltivazione del pistacchio nel Baluchistan iraniano. **(The cultivation of the pistachio in Persian Baluchistan).**
Frutticoltura, Bologna 1959 : **21** : 363–68.

Brief reference is made to locally grown varieties and to related wild species used as stocks.

756 VALDEZ, A. G.
Performance test of three peanut varieties at the Araneta Institute of Agriculture.
Araneta J. Agric. 1958 : **5** : No. 2 : 65–73.

Of the three varieties tested, Spanish Red germinated best and had the highest yield of pods.

757 Raman, V. S.
Studies in the genus Arachis—VI. Investigations on 30-chromosomed interspecific hybrids.
Indian Oilseeds J. 1959 : **3** : No. **3** : 157–61.

Highly sterile hybrids between *A. hypogaea* ($2n = 40$) and two wild species ($2n = 20$), *A. villosa* var. *correntina* and *A.* sp. 'A. 329/7' have been obtained. The hybrids ($2n = 30$) resemble the pollen parent in respect of perennation, profuse flowering, vigorous growth, growth habit and general vegetative characters. The cytology of these hybrids suggests that the groundnut has arisen as an allopolyploid of a cross between two annuals, each with 20 chromosomes, one definitely being a species of *Arachis*. *A. villosa* var. *correntina* and *A.* sp. 'A. 329/7' may be allotetraploids derived from the basic number five as is shown by their regular meiosis, secondary association of bivalents and high fertility.

758 Gregory, W. C. & Cooper, W. E.
Atomic peanut.
Res. & Fmg. 1959 : **17** : No. **4** : p. 3.

The variety NC4x was developed from seed exposed to 18,500 r. Yields are equal to those of Ga.119–20 and approach those of NC2. It is primarily a bunch peanut with thicker hulls, fewer damaged kernels and fewer growth cracks than NC2. It is also more resistant to leaf spot. Some other lines from this irradiated seed are also showing promise.

759 Carmin, J.
First year with peanuts—1955.
Bull. indep. biol. Labs. Israel 1959 : **13** : No. **4** : Pp. 23.

Several leguminous species were grafted, in different ways and on different dates, on to peanut plants. The different scions exerted their influence on the stock in various ways. The duration of the blossoming of the stock usually remained unchanged with *Lupinus palaestinus* and *Vicia faba* as scions, while it was somewhat shortened with *Pisum sativum* and in one case with *L. palaestinus*. It was very much shortened with *Lathyrus marmoratus* as scion but prolonged with *A. hypogaea* and *Trifolium dichroanthum* scions. The number of flowers remained normal in the case of *Lathyrus* and in one case of *V. faba*; they were fewer with *P. sativum* and *L. palaestinus*. The number of seeds was reduced in all cases except for *P. sativum*. The habit of the peanut scions changed and they produced fewer leaves.

760 Aiyadurai, S. G.
Wild species of *Arachis* as forage and soil binding plants.
Indian Oilseeds J. 1959 : **3** : No. **3** : 149–51.

Four wild species, *A. marginata*, *A. glabrata*, *A.* sp. 'A. 354' and *A.* sp. 'A. 329', received at the Agricultural Research Institute, Coimbatore, proved to have a higher mineral, crude protein, fat and calcium content and a lower fibre content than the cultivated groundnut (*A. hypogaea*). In addition to being more nutritious and palatable than *A. hypogaea*, they are also perennial and drought resistant and multiply rapidly by vegetative means, thus having great potentialities as pasture legumes and soil binding plants.

761 Fletcher, W. A., Baumgart, M. G. & Piper, B. M.
Handling Chinese gooseberries for long storage and export.
NZ J. Agric. 1959 : **99** : 15–16.

Differences in yield, keeping quality and vitamin C content have been found between different varieties. Hayward appears to keep better than Bruno or Abbot though these last two varieties are heavier producers. Bruno is particularly rich in vitamin C content while Abbot has the lowest content.

762 Akamine, E. K. & Girolami, G.
Pollination and fruit set in the yellow passion fruit.
Tech. Bull. Hawaii agric. Exp. Sta. 1959 : No. 39 : Pp. 44.

Problems concerning fruit set are discussed. Self incompatibility and some cross incompatibility appear to be the chief cause of the failure to set fruit. The degree of cross compatibility is variable. For example, while C–37, C–77 and C–80 are essentially mutually incompatible, C–39 is highly compatible with all these three lines. It is possible that male sterility causes a difference in response between reciprocal crosses, for, when W–89 was used as a male parent, no fruit set on either W–84 or W–88, but as a female parent it set fruit with pollen from either W–84 or W–88.

Yearbook of the California Avocado Society 1958 : 42 : Pp. 139.

763 *Report of the Avocado Variety Committee. (pp. 14–15).*

Bacon and Zutano are recommended for trial in districts with lower temperatures in California.

764 *Schroeder, C. A. Avocado materials and observations in Costa Rica, Ecuador and Peru. (pp. 72–76).*

Information is provided on wild and cultivated types of *Persea* spp. collected by the author when visiting the above countries during 1957.

765 *Zentmyer, G. A. & Schroeder, C. A. Resistance of species of* Persea *to avocado root rot. (pp. 106–07).*

A report is given of the results of further tests of species of *Persea* and related genera carried out in the search of rootstock and breeding material resistant to *Phytophthora cinnamomi.*

766 BAUMEISTER, G.
Eine Methode zur Keimungsbeschleunigung bei *Rubus*-Samen. **(A method for accelerating germination in *Rubus* seed).**
Züchter 1959 : **29** : 185–87.

A method of scarifying raspberry seeds with a razor blade is described; using this method 50% germination is attained within four weeks.

767 LOGINYČEVA, A. G.
(The self and cross fertility of some varieties of black currant, gooseberry and raspberry).
Agrobiologija (Agrobiology) 1958 : No. **6** : 125–26. [Russian].

An account of self and cross fertility studies of the above soft fruits at Kirov is given, varietal differences being noted.

768 BLASSE, W. & FREYTAG, H. E.
Vergleichende Fruchtfarbstoffmessungen von Himbeersorten. **(Comparative measurements of the fruit pigment of raspberry varieties).**
Gartenbauwiss. 1958 : **23** : 386–91.

Using a photometer, measurements were made of the intensity of the colour of the juice of 40 varieties of German, English and American origin. The highest values were obtained with Shaffer Colossal, The Davon, Türks Frühe Rote [Türk's Early Red] and Heinersdorf. The method described provides a quick and accurate method for determining pigment concentration; it is recommended for breeding work.

769 **Darrow blackberry.**
Fruit Var. hort. Dig. 1959 : **13** : p. 64.

[Cf. XXIX, 3083 and 3085].

770 LARSSON, G.
Norrländska sortförsök med svarta vinbär 1944–1958. **(Varietal trials of black currant in Norrland, 1944-1958).**
Medd. Trädgårdsförs. 1959 : No. 122 : Pp. 30.

The results of trials conducted at seven localities in Norrland, Sweden, are reported. At Öjebyn, a large number of local varieties was tested, several of which proved completely hardy, vigorous and productive and gave berries of fine quality although containing less vitamin C than English and Netherlands varieties.

771 GLEBOVA, E. I. & ŠČUKINA, V. F.
(New varieties of black currant near Leningrad).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 6 : 44–46. [Russian].

Golubka [Dove], Stahanovka [Stahanovite], Vystavočnaja [Exhibition], Neosypajuščajasja [Nonshedding] and Pamjat' Mičurina [Mičurin Memorial] were distinguished by great winter hardiness and high regular yield in trials near Leningrad. The first three are recent selections from the Altaj Horticultural Research Station while the others were bred at Leningrad and Mičurinsk respectively. Neosypajuščajasja is resistant to *Pseudopeziza* leaf spot.

772 **(The gooseberry variety Russkij).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 6 : p. 62. [Russian].

Russkij [Russian] was obtained at Mičurinsk by pollinating Bočenočnyj [Barrel] with a pollen mixture of Štambovyj [Bush] + Haughton + Garry + Oregon. It has large fruit with a fine flavour and is productive and resistant to *Sphaerotheca*. The variety is valued for the ease with which it can be reproduced vegetatively.

773 CORRELL, F. E.
New blueberry varieties.
Res. & Fmg. 1959 : **17** : No. **4** : p. 13.

Garden Blue, from Myers x Clara, and Menditoo, from Myers x Black Giant, are described [cf. XXIX, 3089].

774 EICHHOLZ, W.
Vorkommen des Sanddorns unter besonderer Berücksichtigung des nord- und mitteldeutschen Raumes. **(Occurrence of the sea buckthorn with special reference to the areas of northern and central Germany).**
Arch. Gartenb. 1958 : **6** : 387–403.

Stands of *Hippophae rhamnoides* in northern and central Germany are mentioned and detailed descriptions are provided of some of these, data being provided on the range of variation in berry characters such as 100-berry weight, vitamin C content, dry-matter content and berry colour and form.

775 Blassinsky, J.
Erdbeer-Sortenversuche 1954–1957. **(Strawberry varietal trials 1954-1957).**
Erwerbsobstbau 1959 : **1** : 50–54.

The trials reported were carried out at Bamberg with 13 new varieties. Macherauchs Frühernte [Macherauch's Early Harvest] gave the earliest crop and the yield was high. This variety had the lowest proportion of third-class fruit, the fruit being classified into three classes according to size and condition. Senga Sengana, a medium early variety, gave the highest yields.

776 **(The strawberry variety Narodnaja).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 6 : p. 62. [Russian].

Narodnaja [People's] was obtained by interspecific hybridization between cultivated and wild strawberries at Birjulevo. It has perfect flowers, produces large fruit with a pleasant flavour and is productive, hardy and resistant to drought.

777 Kluge, K.
Das Auftreten von fertilen Sämlingen in den Nachkommenschaften von Kreuzungen der tetraploiden Form von *Fragaria vesca* var. *semperflorens* L. mit Sorten von *Fragaria grandiflora* Ehrh. und reziprok. **(The occurrence of fertile seedlings in the progenies of crosses of the tetraploid form of *F. vesca* var. *semperflorens* L. with varieties of *F. grandiflora* Ehrh. and of the reciprocal crosses).**
Z. Pflanzenz. 1959 : **41** : 151–56.

Crosses were made between a tetraploid form of *F. vesca* var. *semperflorens* and six varieties of the garden strawberry. The progenies showed considerable variation in all characters. Of the 165 hexaploid seedlings obtained, 16 were completely fertile. Only one seedling did not develop runners; this seedling was also fertile. The size of the fruit lay between that of the parent forms and some of the hybrids bore fruit with a good flavour. None of the hybrids continued to bear fruit in late summer and autumn.

778 Frazier, N. W. & Thomas, H. E.
Fate of strawberry plants infected with aster yellows virus in nursery beds.
Plant Dis. Reptr. 1959 : **43** : 645–48.

In an investigation in California into the effect of aster yellows virus on eight strawberry varieties, the variety Lassen with 44% survival appeared the most tolerant.

779 Phadnis, N. A. & Gopalkrishna, N.
Pigmentation of lamina as an aid in classification of banana.
Poona agric. Coll. Mag. 1959 : **49** : 235–39.

Observations on 52 varieties at the Banana Research Station, Poona, showed that intensity of purplish-brown blotching on the leaves of young plants constitutes a varietal chracteristic. Amount of blotching may be regarded as a criterion of the extent to which *Musa acuminata* has entered into the parentage of cultivated varieties.

780 Relazione sull'attività svolta nel decennio 1947–1956. **(Report on activities in the ten-year period 1947-56).**
Annu. Staz. Sper. Vitic. Conegliano 1958 : **18** : Pp. 64.

This report on the activities of the Viticultural Research Station at Conegliano in northern Italy includes an account of the observations made during the ten years on a large collection of vines comprising 300 European wine varieties, 400 European dessert varieties, 150 producer hybrids and 150 rootstock varieties; the first results of the observations have been published and referred to *passim* in *Plant Breeding Abstracts.* Selection work aimed at improving fertility and other qualities has been carried out with the following vines: Cabernet franc, Raboso veronese, Piccolit, Lambrusco di Sorbara, the Schiava types, Verdiso, Merlot and Berl. x Rip. Teleki 8; improved clones of Cabernet franc and Raboso veronese are now available, as well as several selections of the Schiava types and the hybrids Piccolit x Corinto and Piccolit x Tocai 5b. Hybrids of Lambrusco Sorbara, Verdiso and Merlot are under observation. Improved selections have been made from the rootstock Berl. x Rip. Teleki 8 [cf. XXVIII, 3407].

781 Pospíšilová, D.
Výsledky prvých krížení viniča na Výskumnom ústave pre vinohradníctvo a vinárstvo v Bratislave. **(Results of the first vine hydridizations at the Research Institute of Viticulture and Wine-making in Bratislava.)**
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1959 : **32** : 681–96.

A report is given of a detailed analysis of the hereditary characters of a series of recent hybrids, special mention being made of some promising seedlings.

782 Dalmasso, G. & Cosmo, I.
Le comportement comparé des cépages à raisins de cuve. **(Comparative behaviour of strains of wine grapes).**
Bull. Off. int. Vin 1958 : No. 323 : also Annu. Staz. Sper. Vitic. Conegliano 1958 : **18** : No. 14 : Pp. 8.

A brief account of the vine cultivars grown in Italy [cf. XXVIII, 3394] is followed by a list of them in alphabetical order, with indications of the colour of the berry, the areas in which they are grown, their salient characteristics and their main defects.

783 Dalmasso, G., Dell'Olio, G. & Corte, A.
"Nebbiolo".
Ann. Sper. agr. 1959 : **13** : No. **3** : Suppl. : i–xxviii.

The vine of this name, of which a great number of synonyms exist, is grown extensively in the Piedmont area of Italy for the preparation of the wine Barolo; a number of lines, differing in ecological adaptation and the use to which they are put, exist and are defined as cultivars, the variety itself being designated a convariety. A full description is given of one cultivar, Nebbiolo Lampia, indications being given of the respects in which it differs from the four other main cultivars.

784 Dalmasso, G., Dell'Olio, G. & Malfatto, P.
"Grignolino".
Ann. Sper. agr. 1959 : **13** : No. **3** : Suppl. : xxix–xli.

The vine grown under this name in the Piedmont area of Italy for wine making shows considerable variation in berry size and other characters; its main characteristics are described.

785 Dalmasso, G., Dell'Olio, G., Ferrero, M. & Tamagnone, B.
"Freisa".
Ann. Sper. agr. 1959 : **13** : No. **3** : Suppl. : xliii–lviii.

The vine described is used in the Piedmont area of Italy for making red wine, both still and sparkling.

786 Dalmasso, G., Dell'Olio, G., Corte, A. & Malfatto, P.
"Barbera".
Ann. Sper. agr. 1959 : **13** : No. **3** : Suppl. : lix–lxxiii.

The vine described, which gives rise to the well known wine of this name, is widely cultivated in the Piedmont area of Italy and elsewhere. Nothing is known as to its origin and it seems to have come from a chance seedling selected by a local grower.

787 Dalmasso, G., Dell'Olio, G. & Ricci, P.
"Dolcetto".
Ann. Sper. agr. 1959 : **13** : No. **3** : Suppl. : lxxv–lxxxix.

The vine described is grown in certain parts of the Piedmont area of Italy for the production of a fine light wine which, in spite of the name of the vine, is dry and not sweet.

788 Ivanov, I.
(Hybrid 1-4—a new valuable early variety of dessert vine).
Lozarstvo i Vinarstvo (Viticulture & Wine-making) 1958 : **7** : No. **5** : 9–14 : from Ref. Bjull. bolg. naučn. Lit. (Ref. Bull. Bulg. sci. Lit.) 1959 : No. **1** : Abst. **64** : p. 40. [Bulgarian].

Hybrid 1–4 (Bulgarian x hybrid III–2) is an early dessert variety with berries and bunches larger than those of hybrid III–2 and Perle de Csaba. It is resistant to mould and its transportability is good.

789 Semenov, G.
(The vine in the Primor'e).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. **10** : 69–71. [Russian].

Mention is made of two new early vine varieties bred at the Primor'e Horticultural Field Research Station. Vine 60 is a high-yielding dessert kind with largish grapes and is resistant to mildew, while vine 174 is distinguished by good flavour and resistance to low temperature.

790 Scott, D. H. & Christ, E. G.
The Dix grape, a new juice variety.
Fruit Var. hort. Dig. 1959 : **13** : p. 59.

[Cf. XXIX, 4444].

791 Harmon, F. N. & Weinberger, J. H.
Exotic, a new vinifera grape variety.
Fruit Var. hort. Dig. 1959 : **13** : p. 56.

[Cf. XXIX, 4433].

792 Cosmo, I.
Due promettenti selezioni del "Teleki 8": il "C.2" ed il "C.10". **(Two promising selections of Teleki 8: C2 and C10).**
Atti Accad. ital. Vite Vino, Siena 1958 : **9** : also Annu. Staz. Sper. Vitic. Conegliano 1958 : **18** : No. **1** : Pp. 40.

A detailed account is given of work referred to already elsewhere [cf. XXVIII, 3407].

793 HENKE, O.
Untersuchungen über den Einfluss von *Vitis cinerea* Arnold auf einige biochemische Eigenschaften der Kreuzungsnachkommen. (**Investigations on the influence of *V. cinerea* Arnold on some biochemical properties of cross progenies**).
Z. Pflanzenz. 1959 : **41** : 253–70.

Leaves of *V. cinerea* 'Arnold' were found to contain phenolic compounds which have not been found in other species of vine; these substances are thought to be flavonol glycosides. Most of the progeny from crosses between *V. cinerea* 'Arnold' and other *Vitis* species also produced these compounds. Both the Arnold and Klosterneuburg types of *V. cinerea* and most of the Arnold hybrids have very low flavonoid contents and high phenoloxidase activity in their leaves as compared with other vine species.

794 SINGH, S. N.
Germination of pollen grains of *Vitis vinifera*.
Curr. Sci. 1959 : **28** : p. 258.

With a view to hybridization at the Horticultural Research Institute, Saharanpur, media were tested for their suitability for the determination of pollen viability. A 25% sucrose solution proved to be the most satisfactory.

795 COUTINHO, M. P.
Aspectos anatómicos dum tipo floral anómalo, na videira. (**Anatomical aspects of an anomalous floral type in the vine**).
Bol. Soc. broteria. : Sér. 2A 1958 : **32** : 219–24.

A description is given of a floral anomaly involving stellate rather than cucullate anthesis. It appeared in certain clones derived from the cross Jaen x Azal branco [White Azal], the incidence depending on environmental conditions.

796 BLAHA, J.
Otázka jakosti v klonové selekci révy vinné. (**The question of quality in clonal selection of the grape vine.**)
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1959 : **32** : 697–704.

Methods of evaluating the quality of grapes are discussed and a way of expressing a quality evaluation numerically is described. Also a method of judging the acid content of vine products is suggested.

797 KATAR'JAN, T. G.
(**At the Magarač All-Union Scientific Research Institute of Viticulture and Wine-making**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 11 : 75–82. [Russian].

Breeding of vines at the above institute and its branch research stations is described. Among the hybrids bred in recent years in the Crimea are Magarač 166 and 171, both from Mourvèdre x Muskat Kal'jabskij [Kal'jabskij Muscat], and 308 (Muskat Fioletovyj [Mauve Muscat] x Muskat Kal'jabskij) which make strong or dessert wines, and the early dessert varieties 339 (Madeleine Angevine x Šuvargany) and 379 (Madeleine Angevine x Šakar Angur). A new variety from Central Asia, 7–33 [Tagobi x (Tagobi x Amur)] has been obtained; it is winter hardy and productive of grapes making high quality wine. Also mentioned is a hybrid obtained at Moscow by pollinating Malingre with a pollen mixture of *Vitis vinifera* varieties. The hybrid has perfect flowers and a short growth period; it is winter hardy and the grapes have a good flavour.

798 COUTINHO, M. P.
O comportamento de algumas videiras resistentes à *Plasmopara viticola*, perante a modificação das condições ecológicas. (**The behaviour of some vines resistant to *P. viticola* under a change of ecological conditions**).
Agron. lusit. 1955 : **17** : 205–14.

Some clones selected from the crosses Jaen x Azal branco [White Azal] and Souzão x Azal de correr have proved resistant to the above disease both at Sacavém, Portugal, and on Madeira.

799 BOUBALS, D.
Contribution à l'étude des causes de la résistance des Vitacées au mildiou de la vigne (*Plasmopara viticola* (B. et C.) Berl. et de T.) et de leur mode de transmission héréditaire. [**A contribution to the study of causes of the resistance of Vitaceae to downy mildew (*P. viticola* [B. et C.] Berl. et de T.) and their mode of inheritance**].
Ann. Inst. nat. Rech. agron., Paris : Sér. B 1959 : **9** : 1–233.

A scale of resistance is described by which various species of Vitaceae and other Angiosperms are classified. Complete immunity to *P. viticola* seems to be very rare in Vitaceae and has only been found in *Cissus discolor*. Resistance to penetration by the germination tube of the zoospore depends partly on epidermal structure. Pinot meunier and Berger have a hairy lower epidermis and *Vitis lincecumii* and *V. piasezkii* have a waxy layer on the lower epidermis; these structures prevent the surface of the leaf from becoming wet and so the zoospore is unable to germinate. However this type of resistance is not of primary importance for the flowers and fruits of those species are not protected from wetting and are easily attacked by the pathogen. In susceptible species the tissues of the leaf veins tend to restrict the spread of the fungus in the host tissues, for the fungus cannot penetrate lignified tissue. The foliage of late-maturing types is more susceptible than that of earlier types because the vein tissue takes longer to become lignified. Certain physiological conditions which increase the resistance of the foliage are mentioned.

In *Tetrastigma* and *Cissus*, which are only distantly related to *Vitis*, resistance to *P. viticola* involves a necrosis of the mycelium formed after the zoospore has entered a stoma; at the same time the cells of the stoma and stomatal air cavity undergo necrosis. In other species necrosis of the stoma also occurs but it is not accompanied by death of the mycelium and the stomatal necroses do not play a part in resisting the pathogen. The development of the mycelium in these host species seems to depend on the presence of nutritive substances in the host cells and differences in the content of such substances are thought to be responsible for differences in resistance between *Vitis* species.

Samples of *P. viticola* from different sources have shown differences in virulence indicating the existence of physiological races.

It was found impossible to make the necessary intergeneric crosses to determine the mode of inheritance of resistance involving death of the mycelium immediately after penetration into the stoma. The capacity for necrotic reaction of the stomata was found to be a monofactorial character. All the species having this character were homozygous for the dominant gene concerned. *V. vinifera* is homozygous for the recessive allele responsible for the absence of a necrotic reaction of the stomata.

Resistance depending on limiting the spread of the mycelium within the host was found to be polygenically controlled. In crosses between *V. vinifera* on the one hand and *V. riparia*, *V. aestivalis*, *V. labrusca*, *V. cordifolia*, *V. candicans*, *V. rubra* and *V. berlandieri*, on the other hand, and between *V. berlandieri* and *V. riparia*, the cumulative effect of the resistance genes was of an arithmetic nature. But, in crosses between *V. vinifera* and *V. rupestris* or *V. monticola*, the effect was geometrical. In each cross there seems to be partial dominance of either the alleles for resistance or of the alleles for susceptibility and this depends on the variety of *V. vinifera* used. The number of genetic factors involved varies between one and four. Ways of increasing the resistance of *V. vinifera* are discussed; *V. riparia* seems to be the most promising species to cross with *V. vinifera* for it has given most resistant progeny in the F_2.

800 Serafim, F. J. D.
Coremium luteolum S. Camara, causa de uma doença das folhas de algumas videiras. **(*C. luteolum* S. Camara, cause of a leaf disease of some vines).**
Agron. lusit. 1955 : **17** : 297–334.

The above newly discovered species was first observed at Sacavém, Portugal, in 1950 where it was responsible for a leaf-spot disease. Experimental inoculation showed that *Vitis rupestris* 'du Lot', *V. berlandieri* x *V. rupestris*, Aramon x *V. rupestris*, Mourvèdre x *V. rupestris* '1202' and Diagalves had a certain degree of resistance.

801 Schäller, G.
Untersuchungen über die Gallbildung und Nekrosereaktion der Rebensorten unter Berücksichtigung der Rassendifferenzierung der Reblaus. **(Investigations on the gall formation and necrotic reaction of grape varieties with reference to racial differentiation in phylloxera).**
Phytopath. Z. 1959 : **36** : 67–83.

On incompatible hosts, phylloxera races cause (*a*) extreme or (*b*) intermediate necrosis of the leaf tissues and fail to survive, while on compatible hosts galls are produced and the parasites multiply. On hosts on which galls have been previously induced and the parasites subsequently removed, incompatible races of type (*a*) were not or hardly able to survive and the galls ceased growing or became necrotic, but those of type (*b*) multiplied and promoted gall development. It is concluded that the factor determining host reaction is probably the ability of the parasite to initiate gall formation rather than its capacity to utilize the nutrients provided by the host.

802 Zotov, V. V. & Sokolovskaja, T. I.
(Different forms of tanning substances in healthy vine roots and in roots attacked by phylloxera).
Biohim. Plod. Obošč. (Biochem. Fruit Veg.) 1959 : No. 5 : 195–203. [Russian].

The highest content of tanning substances was found in the roots of Saperavi and the lowest in White Chasselas, both susceptible varieties; certain resistant varieties such as the rootstock Riparia x Rupestris 101–14 were intermediate. After infection with phylloxera however the resistant variety developed more tanning substances than the susceptible and chromatographic analysis showed the presence of certain compounds in the resistant Riparia x Rupestris 101–14 that were absent in Chasselas.

803 Dias, H. F.
Clorose infecciosa da videira. I. Expressão sintomatológica da "virose" nos principais porta-enxertos. **(Yellow mosaic of the vine. I. Expression of the symptoms of the virus disease in the principal stocks).**
Agron. lusit. 1955 : **17** : 367–74.

Out of 29 stocks graft-inoculated with the virus, all proved susceptible but they could be divided into three groups on the basis of the symptoms expressed.

FOREST TREES

804 Mergen, F.
Forest tree breeding research.
Unasylva 1959 : **13** : 81–88.

With a view to showing the role of breeding in the improvement of seed production, a general account is given of methods of (1) tree selection in the field, (2) subsequent progeny and clonal testing and (3) vegetative propagation of superior genotypes.

Report on Forest Research by the Forestry Commission for the year ended March, 1958 : Pp. 191.

805 *Wood, R. F. & Lines, R. Provenance studies. (pp. 51–57).*

Cryptomeria japonica. A study of 11 introduced samples has begun.

Lodgepole pine. Observations made on the Alberta introduction show that it is more susceptible to needle discoloration, ill health and even death under exposed or poor soil conditions than material from the southern interior of British Columbia. Seed size and quality of continental and coastal samples have been compared. New provenance experiments have begun in central Wales and south-western England.

Sitka spruce. It appears that considerably greater yields may be obtained with samples of more southerly provenance on suitable sites. Material from Queen Charlotte Islands was less affected by autumn frosts than the more southerly Washington sample.

Larch. Preliminary results suggest that Polish larch is very suitable for use in Great Britain, especially on the more exacting sites.

806 *Jobling, J. Poplars. (pp. 58–60).*

Twenty-two varietal trials in different parts of the country are in progress.

807 *Matthews, J. D., Mitchell, A. F. & Faulkner, R. Forest genetics. (pp. 63–68).*

The selection and propagation of plus trees of the more important forest species have been continued. Progeny are being raised from controlled self and cross pollinations of plus trees of pines, larches, Douglas fir and beech. Seed orchards for the production of F_1 hybrids between European and Japanese larches have been established in several localities of England and Scotland.

808 *Murray, J. S. Forest pathology. (pp. 69–72).*

The results of an infestation of *Melampsora pinitorqua* on a mixed plantation of two-needled pines and aspens are included. Typical lesions were seen in the shoots of *Pinus sylvestris* and *P. pinaster* but not on *P. nigra* var. *calabrica*, *P. resinosa* and *P. radiata*. Uredial leaf spots occurred heavily on *Populus tremula* but not at all on two American aspens, *Populus grandidentata* and *Populus tremuloides* and only moderately on the hybrid *P. tremula* x *P. tremuloides*.

809 *Edwards, M. V. First report on an investigation begun in* 1935 *into three races of European larch. (pp. 164–83).*

The nursery and early forest stages of a provenance experiment with Alpine (Münsterthal, Switzerland), Sudeten (Silesia) and Scottish (Darnaway) larch are described. It is concluded that though Alpine larches do not suffer from die back on the most favourable frost-free sites, the risk of frost is too great for them to be grown. Sudeten and certain selected Scottish samples are sufficiently resistant under fairly severe conditions to produce satisfactory stands.

Proceedings of the Third Lake States Forest Tree Improvement Conference, September 17, 18, 1957.
Sta. Pap. 1958 : No. 58 : Pp. 87. (Mimeographed).

810 *Mitchell, H. L. Applying forest tree improvement practices in the Lake States; production of quality wood. (pp. 18–29).*
The need for breeding for quality, including high specific gravity and uniformity of growth, is stressed. It is noted that, in a survey conducted in Mississippi, specific gravity in pines is strongly correlated with age, shows significant interspecific differences and displays significant intraspecific increases from northern to southern parts of the state.

811 *McCulley, R. D. Forest tree improvement activities at the Lake States Station during the past two years. (pp. 30–34).*
Work in progress includes the study of self and interspecific compatibility in spruce, provenance and progeny tests of various conifers and investigations on blister rust. Evidence of racial differentiation in this pathogen on *Ribes* species has been obtained.

812 *Hitt, R. G. Forest tree improvement in the department of genetics at the University of Wisconsin. (pp. 38–41).*
Among mechanical methods tested as means of inducing flowering in *Pinus resinosa*, spiral girdling produced the greatest response in numbers of both male and female flowers but caused severe damage. Partial girdling also increased flowering and caused less injury. Flowering increased slowly in response to strangulation. Root pruning resulted in the initiation of flowering on nonflowering trees but had no stimulating effect on trees already in flower. A number of mutant forms found include a prostrate bushy type, a snake type and a fastigiate type with short, fine branches at an acute angle.

813 *Berbee, J. G. Forest tree improvement in the department of plant pathology at the University of Wisconsin. (pp. 42–44).*
In crosses between blister-rust resistant white pines, some difference in the ability to transmit resistance was found among different parents. Interspecific crosses have been effected with the aim of obtaining resistant material. Several interspecific and intraspecific hybrids of *Populus tremuloides*, *P. grandidentata*, *P. deltoides*, *P. alba* and *P. tacamahaca* have been developed and are being tested for disease resistance.

814 *Barnes, B. V. Recent advances in forest tree improvement at the University of Michigan. (pp. 44–45).*
The breeding work has included the establishment of a larch provenance trial and the development of a population of *Populus tremuloides* x *P. tremula*. Spontaneous clones of *P. alba* x *P. grandidentata*, *P. grandidentata* x *P. tremuloides* and perfect-flowered *P. tremuloides* have been found in lower Michigan.

815 *Einspahr, D. Progress report, forest genetics work at the Institute of Paper Chemistry. (pp. 48–50).*
Polyploid aspens have been obtained by means of colchicine treatment and through hybridization with a polyploid parent. Triploids of *Populus tremuloides* have been found occurring naturally.

816 *Ahlgren, C. E. Tree improvement work in progress at the Quetico-Superior Wilderness Research Center. (pp. 53–54).*
In experiments on the stimulation of flowering, marked differences in degree of flowering and vegetative growth have been found among different interspecific graft combinations of pine. For instance, *Pinus cembra* scions on *P. resinosa* grew slowly but flowered well while on *P. strobus* they grew well but flowered very little.

817 *Cram, W. H. Progress report for shelterbelt tree improvement and nursery problems in prairie Canada. (pp. 55–58).*
Poplar. Of 17 clones planted in 1951, one *Populus deltoides* selection, FNS44–52, was outstanding in survival (94%), vigour and absence of cankers.
Caragana. In breeding for shelterbelts, 13 vigorous, self-incompatible selections have been obtained, unfortunately all of the same compatibility genotype and therefore also cross incompatible. Compatibility appears to be determined by several *S* factors. Results from tests of inbred and hybrid progenies indicated that the potential vigour of the progenies may be estimated with reasonable accuracy from the height of the 4-year-old seedlings. Several of the inbreds from highly self-fertile selections are very vigorous.
Spruce. Selection for resistance to *Phenacaspis pinifoliae* is in progress in Colorado spruce. Some evidence of differences in self and cross compatibility within this species has been obtained.

818 *Zobel, B. J. Results of research on genetic phases of wood properties of loblolly pine. (pp. 61–64).*
In *Pinus taeda* no relation was found between

specific gravity and rate of growth or environmental factors. The progenies of five open-pollinated trees of known specific gravity tended to resemble their respective mother trees in this character. Selection may be effected in 3-year or 4-year old trees, since there are high correlations between the specific gravity of the juvenile wood on the one hand and that of the mature wood and of the limbs of the young tree on the other.

819 *Wakeley, P. C. Summary of forest tree improvement work in the south. (pp. 65–71).*

Gabriel, W. J. Summary of forest tree improvement work in the northeast. (pp. 72–74).

Kriebel, H. B. Forest tree improvement work in the central states. (pp. 75–77).

Outlines of the main lines of work in progress at centres in the southern, northeastern and central USA are given.

820 BOLLAND, G. & HOFFMANN, K.
Die Verwendung von Randlochkarten in der Forstpflanzenzüchtung unter besonderer Berücksichtigung der Aufnahme von Auslesebäumen. **(The application of punched cards in forest tree breeding with special reference to the survey of selected trees).**
Silv. genet. 1959 : **8** : 69–84.

The value of punched cards in keeping records of the characteristics of selected trees and in making evaluations on the basis of many characters is pointed out, special reference being made to the use of such cards in provenance investigations and resistance breeding. Some practical information on the use of punched cards is also given. Other methods of recording and assessing tree characters are described.

821 CARVALHO, A. DE
Identificação de um possível fóssil de sobreiro (*Quercus Suber* L.) proveniente de solos do mioceno lacustre do Alentejo. **(Identification of a possible fossil of the cork oak (*Q. Suber* L.) coming from the Miocene lake deposits of Alentejo).**
Bol. Soc. broteria. : Sér. 2A 1958 : **32** : 75–78.

A Portuguese wood sample, identified as pertaining to the above species, has been collected at Ponte de Sor.

822 BESKARAVAJNYJ, M. M.
(New facts on coalescence of forest trees belonging to different species in the conditions of the Kamyšin district). Agrobiologija (Agrobiology) 1958 : No. 6 : 132–35. [Russian].

Reported instances of natural graft hybridization included one between *Acer platanoides* and *A. tataricum.* The seed from each of the graft components was larger, better developed and showed improved viability by comparison with the normal species and the seedlings raised from them grew quicker than those of normal trees. The utilization of graft hybrids in breeding is recommended.

823 **Report of the Soil Conservation and Rivers Control Council for the year ended 31 March 1959** : Pp. 51.

Natural hybrids between a female *Populus deltoides* cv. *virginia* and a male *P. yunnanensis* have been discovered in New Zealand. They appear to be particularly vigorous in the nursery. Natural hybridization has only occurred recently because male and female trees of clones flowering at approximately the same time have not been frequently planted together and the seeds require exacting conditions for germination

Of the black poplars, the hybrid *P. robusta* showed the greatest adaptability to marginal conditions. *P. alba, P. tremula* and the hybrid *P. canescens* also showed adaptability. *P. tremula* and *P. canescens* appear to have a deeper root system than most black poplars, an important characteristic in soil stabilization work.

824 MACKEVIČ, N. V.
(Experimental polyploidy of *Populus tremula* L.)
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **126** : 183–86. [Russian].

Seedlings obtained from seeds of *P. tremula* and *P. balsamifera* germinated in colchicine solutions of up to 0·1% were retarded in growth and some of them proved to be tetraploids, with $2n = 76$ in the root tips as against $2n = 38$ in the original forms. Others were chimeras and some aneuploid. The leaves of the tetraploid *P. tremula* were larger than those of the diploid and were dissected, with pubescence on the under surface; the growth rate was as high as that of the diploid.

Tetraploid seedlings were obtained from *Euonymus europaea* by treatment of germinating seeds for 24 hr. with a colchicine solution of 0·15%.

825 MEYER-UHLENRIED, K. H.
Über die Vererbung der Holzfaserlängen bei verschiedenen Arten der Gattung *Populus*. **(The inheritance of wood fibre lengths in different species of the genus *Populus*).**
Züchter 1959 : **29** : 117–23.

Measurements of the length of the wood fibres of various *Populus* species and hybrids revealed that there are two different types of fibre in the wood. Locality did not have much effect on fibre length. The two sections *Aigeiros* and *Tacamahaca* differed in the average fibre length; the *Tacamahaca* type was dominant in hybrids between the two sections and the mode of inheritance of this character seemed to be complicated. Within the sections no marked differences between species were found.

826 HUTTON, E. M. & GRAY, S. G.
Problems in adapting *Leucaena glauca* as a forage for the Australian tropics.
Emp. J. exp. Agric. 1959 : **27** : 187–96.

It appears that *L. glauca* could be successfully grown under the conditions of Australian tropical coastal and subcoastal country. Strains tested at the CSIRO Pasture Research Station, Samford, include samples from El Salvador, Guatemala, Peru, Hawaii, the Philippines, Rhodesia, New Guinea, Fiji, New Caledonia and Queensland. *L. glauca* is self compatible and mainly self pollinated so that intrastrain variation is low. The toxic principle present is mimosine and in breeding for a low mimosine content it appears necessary first to select parental types with this character from within strains such as that from El Salvador. A number of successful crosses have been made by using a new emasculation technique. The flower heads were shaken soon after dehiscence in a 0·1% solution of gardinol K and after drying, pollen from the male parent (collected in porous-type cellophane bags) was applied to the stigmas with the fingers. The hybrid populations show a wide range of variability and hybrid vigour. The vigorous and high-yielding strains from Peru, El Salvador and Guatemala seem to be particularly valuable in breeding improved types.

827 STEIKHARDT, H.
Untersuchungen über Sortenwahl, Stickstoffdüngung, Pflanzgutgrösse und Pflanzverband im Korbweidenbau. **(Investigations on varietal choice, nitrogen fertilization, size of planting material and arrangement of plants in basket-willow cultivation).**
Kühn-Archiv 1958 : **72** : 376–429.

Of the seven varieties investigated, Ulbrich and Kottenheid gave the best yields in damp districts and Schmidts Hanfweide Mulattin and Turkenberg were best in drier districts. Kottenheid is also noteworthy for its high quality.

828 ORTMANN, C.
Zur Methodik der künstlichen Samenträgerkultur und Sämlingsanzucht bei *Salix*. **(Methods of artificial culture of seed bearers and rearing seedlings of *Salix*).**
Züchter 1959 : **29** : 132–37.

A new procedure is described for greenhouse culture of *Salix* twigs for use in hybridization experiments. The twigs are planted in trenches of coarse sand surrounded by a loam containing humus. Under these conditions a good root system develops and also the catkins complete normal development. Seedlings were successfully raised in boxes filled with a humus-containing loam, the seeds having been sown in a narrow layer of mixed peat and sand on top of the loam.

829 RODGER, G. J.
Annual Report of the Forestry and Timber Bureau, Commonwealth of Australia, for the year ended 31st December, 1957 : Pp. 45.

Pinus. Breeding *P. radiata* at the Central Research Station, Canberra, continued. Establishment of clones of selected trees and progenies resulting from open pollination and controlled crosses received attention. Of the 33 trees newly selected in 1957, one was a fairly vigorous hybrid of *P. radiata* x *P. attenuata*. The following crosses were successful: *P. radiata* x *P. remorata*; *P. patula* x *P. attenuata*; crosses of (*P. patula* x *P. greggii*) with *P. radiata*, *P. remorata* and *P. patula*; *P. attenuata* x *P. patula*; *P. attenuata* x *P. radiata*; *P. muricata* x *P. patula*; and *P. muricata* x *P. radiata*. Progenies from *P. nigra* var. *calabrica* x *P. halepensis* and *P. canariensis* x *P. longifolia* were planted in the field. Breeding of *P. radiata* at the Mount

Burr Forest Experimental Station, South Australia, is also reported.

830 Bannister, M. H., Brewerton, H. V. & McDonald, I. R. C.
Vapour-phase chromatography in a study of hybridism in *Pinus*.
Svensk PappTidn. 1959 : **62** : 567–73.

Steam-volatile fractions of oleoresin obtained by tapping from *P. attenuata*, *P. radiata*, their artificial hybrids and some putative hybrids were analysed by vapour-phase chromatography at the Forest Research Institute, Rotorua, New Zealand. *P. attenuata* was high in α-pinene and low in β-pinene, while the reverse was true of *P. radiata*; the artificial and putative F_1 hybrids, with one exception among the latter, were intermediate in α-pinene/β-pinene ratios, and several putative hybrids were intermediate between *P. radiata* and the F_1 hybrids. For the 47 samples studied, there was generally a close agreement between the ranking based on chemical analysis and that based on morphological characters, supplemented in some instances by progeny tests. Since the samples required weigh only 1–2 g. each, the method is thought to be of use in population studies of the *P. attenuata-radiata* complex, but the volatile oils of winter buds and spring shoots should not be used, since these differ from those obtained from the oleoresin.

831 Dobrinov, I.
(Progress in breeding forest trees in Bulgaria).
Gor. Stop. (Forestry) 1958 : **14** : No. **1** : 5–9 : from Ref. Bjull. bolg. naučn. Lit. (Ref. Bull. Bulg. sci. Lit.) 1958 : No. **1** : Abst. 27 : p. 18. [Bulgarian].

Mention is made of five different ecotypes of pine found in Bulgaria.

832 Schütt, P. & Hattemer, H. H.
Die Eignung von Merkmalen des Nadelquerschnitts für die Kiefern-Bastarddiagnose. **(The suitability of characteristics of the transverse section of needles for the diagnosis of pine hybrids).**
Silv. genet. 1959 : **8** : 93–99.

The number and the position of the resin ducts, the development of sclerenchyma layers between the steles, the thickness of the hypodermis and the form of the pericycle were investigated in transverse sections of needles of *P. nigra* and *P. sylvestris*. All these characters varied to a greater or lesser degree. They varied between individuals, between needles of the same individual and between regions of the same needle; also the age of the needle affected these characters. The most stable characters were the position of the resin ducts and the development of sclerenchyma between vascular bundles. It is concluded that an analysis of needle characters alone is not sufficient for the diagnosis of hybrids. In F_1 hybrids of *P. nigra* x *P. sylvestris*, the needle characters investigated were not intermediate between the parental types.

833 Langner, W.
Selbstfertilität und Inzucht bei *Picea Omorika* (Pančič) Purkyne. [**Self fertility and inbreeding in *P. omorika* (Pančić) Purkyne**].
Silv. genet. 1959 : **8** : 84–93.

P. omorika is a relict species from the Tertiary period and has a very restricted distribution in a few areas in Bosnia and Serbia. It is very uniform in growth habit and in 1000-seed weight. However recent investigations have revealed some variation in the time of coming into leaf and in the time of flowering of 50-year old trees. This species is parthenocarpic and apomixis may occur, for 11 seeds were found in 12 unpollinated clones; these seeds did not germinate. *P. omorika* differs from other *Picea* species in being equally self and cross fertile. It is probable that when pollination with a mixture of self and foreign pollen occurs, more cross than selfed progeny results on account of better germination of the foreign pollen.

Seeds from selfings and crosses germinated equally well but some inbreeding depression was found amongst one and two-year-old seedlings from the selfings; the degree of depression varied between the seedlings. Also some of the selfed seedlings had yellow needles; this has also been found in *P. abies*. Chlorophyll defects seem to result when certain genes are homozygous.

The prospects for breeding with *P. omorika* are discussed. It is suggested that highly inbred lines be crossed with one another to produce heterotic progenies and also be crossed with other species.

834 Nilsson, B.
Om lärkfrö och lärkhybrider för Mellansverige. **(On larch seed and larch hybrids for central Sweden).**
Svenska SkogsvFören. Tidskr. 1959 : **57** : 309–24.

From crosses effected at Brunsberg in 1956 among *Larix decidua, L. leptolepis, L. sibirica, L. gmelini* var. *principis-rupprechtii, L. gmelini* var. *japonica, L. lepteuropea* and *L. eurojaponica*, 12,000 two-year-old plants comprising 41 cross combinations were obtained in 1958. The total number of seeds per cone varied from 13 to 80 but was relatively constant within clones; the number of viable seeds was 0·37 and was generally proportional to the total seeds. Among nine selfed clones, three proved self sterile, five partially self fertile and one self fertile. Strong correlations between seed weight on the one hand and dry weight of the cotyledons, hypocotyl length and fresh weight of the hypocotyl plus cotyledons on the other were detected. In three progenies there was also a high correlation between seed weight and growth in the first year, but for the remaining progenies there was little or none.

Second-year growth data indicated that the inheritance of growth was additive, different parents generally giving consistently good or less good progeny. Interspecific hybrids grew better than pure species, and inbred material showed distinct inbreeding depression. *L. lepteuropea* x *L. sibirica* was particularly promising and was superior to back crosses to both parents. Frost damage was least in progenies with *L. sibirica* as one parent. Intraspecific combinations of *L. leptolepis* and particularly of *L. decidua* were more susceptible to frost damage than the hybrids between the two species.

Although the dry-matter contents of the shoot tips of the different progenies appeared to be unrelated to differences between father trees, they were correlated with mother-tree values. There was, however, no relation between dry-matter content and frost hardiness. Growth was negatively correlated with dry-matter content ($r = -0{\cdot}4$).

For central Sweden, a hybrid of *L. sibirica* and *L. gmelini* var. *principis-rupprechtii* appeared promising, being vigorous and highly resistant to frost damage.

835 Hofman, J. & Heger, B.
Vzrůstavost hladkokorých a hrubokorých typů douglasky. (**On the growth rate of types of Douglas fir with smooth and rough bark**).
Preslia 1959 : **31** : 287–303.

Three types of Douglas fir are distinguished, differing in the form of their bark. The type with gnarled bark having deep furrows was found to grow more rapidly in height and girth than the type with narrower furrows and the type with smoother bark, the last-mentioned being the slowest grower.

VEGETABLES

836 **Ninth Annual Report of the National Vegetable Research Station, Wellesbourne, Warwick 1958** (1959) : Pp. 55.
Haigh, J. C. Plant breeding report. (pp. 13–17).

Asparagus. So-called super male plants have been bred which give an all-♂ progeny when crossed with normal ♀ plants. Super males are derived from andromonecious males, which constitute 1–2% of the ♂ plants of an ordinary population. Most of these abnormal males bear only a few berries, but occasionally one is found which is almost ☿, i.e. almost fully berried. Possibly selection for the last-mentioned type might lead to the synthesis of the ☿ form from which diecious asparagus has probably arisen by mutation.

Cabbage. Selections of spring-cabbage varieties were selfed and also crossed pair-wise within and between varieties. Three varieties produced consistently superior progenies in all combinations. The best individual progeny, from a cross within one of the varieties, was ready to cut as spring greens about ten days before any other and remained fit to be marketed as hearted cabbage 5–6 weeks later. The prospects of developing a dual-purpose variety are therefore promising. Selections were made from several progenies for further breeding.

Progress has been made in breeding a winter cabbage free from rosette heads.

Cauliflower. Cambridge 5 is the earliest summer cauliflower on the British market but its quality leaves much to be desired. Work was initiated in 1954 with the purpose of obtaining better quality in an even earlier strain, two methods being used: (1) selection of inbred lines of Cambridge 5 and (2) hybridization of this variety with the high-quality Dutch variety van den Berg's 35. In general, the earliness and quality gained in the S_1 are being steadily lost in successive inbred generations, although the quality appears to be maintained in a few lines. Selections were made from the best lines for trial. Selections were also made from the F_3 of the above-mentioned cross and the selfed progenies of the BC_1 to the Dutch variety for further breeding but is appears to be difficult to combine the earliness of one variety with the quality of another.

Brussels sprouts. To obtain data on combining ability and hybrid vigour, tests were carried out on hybrids between (1) selected S_2 and S_3 plants of Cambridge Special and (2) these inbred plants and selected S_1 individuals of Cambridge 1. At a plant spacing of 2½ ft. square the best hybrid family in group (1) exceeded Cambridge Special by 41% in yield of marketable sprouts, while at a spacing of 3 ft. square the best in (2) showed a superiority of 78% over the mean yield of marketable sprouts of the two parental varieties.

Celery. An attempt is being made to improve the quality of self-blanching celery by crossing it with green celery. Since emasculation is both laborious and uncertain of result, a preliminary study has been made to determine whether hybrids may be produced between these types without emasculation and the hybrids easily distinguished. All the plants from the cross green ♀ x self blanching ♂ were green. In contrast, the progeny from self blanching ♀ x green ♂ contained green plants in a proportion ranging from 7 to 95% according to the varieties used as parents, the remainder being self-blanching. The two types in the progeny could be distinguished by a difference in intensity of green colour at the time of opening of the second true leaf. The self-blanching plants bred true when selfed. The green individuals, when selfed, gave green seedlings, one fourth of which subsequently developed yellow leaves. It was therefore concluded that hybrid seedlings from self blanching ♀ x green ♂, without emasculation, are identifiable.

Tomato. Back crossing has been initiated to transfer the resistance to *Didymella lycopersici* discovered in a strain of *Lycopersicon hirsutum* to cultivated tomatoes.

Crosses between members of the subgenera *Eriopersicon* and *Eulycopersicon* may only be made when a representative of *Eriopersicon* is the ♂ parent. Similarly, F_1 hybrids will mate in back crosses to species in *Eulycopersicon* only as males and to species of *Eriopersicon* only as females. Most members of the latter subgenus are self incompatible under conditions at the station and transmit this incompatibility as a dominant character to hybrids with species in *Eulycopersicon*.

Pea. In continuation of the attempt to produce a winter-hardy, early-maturing culinary pea of good quality, round and wrinkled seeds from each F_1 family from crosses between round-seeded Austrian winter maple and wrinkled-seed culinary varieties were sown separately. The initial stand of plants raised from wrinkled seed was significantly poorer than that of plants from round seed and later spells of hard weather killed established plants more extensively among those grown from wrinkled seed. Those hybrids raised from wrinkled seed survived throughout the season, however, so that combination of winter hardiness and wrinkled seed appears feasible. Plants with wrinkled seed, white flowers and determinate habit were selected.

Other crops. It is mentioned that progress has been made in breeding disease-resistant lettuce, nonbolting Detroit beet and hybrid onions.

Nelder, J. A. Statistics report. (pp. 43–44).

The following investigations on biometrical genetics are among the activities reported.

"In experiments on the inheritance of quantitative characters, estimates of variance components have hitherto been obtained by using a least-squares method in which the information supplied by the different generations has been taken to be equal and independent. In practice this is not so and the possibility arises, therefore, of improving the accuracy of estimation by weighting the different generations according to their informativeness. Expressions for the optimum weights have been worked out for various theoretical systems of inheritance, and the adequacy of a simplified method suitable for use in practice has been tested and found satisfactory."

Data on flowering time and seed size and shape have been collected from a further field experiment on French bean, "using a diallel cross of six varieties together with all the F_2's." The adequacy of existing theoretical models for the data is being tested.

Annual Report of the Glasshouse Crops Research Institute, Littlehampton, Sussex 1957 : Pp. 161.

837 *Darby, L. A. IV. Plant breeding. (pp. 116–19).*

An attempt is being made to improve the plant habit and size, shape and colour of the fruit of tomatoes, the number, weight and quality of the fruit of cucumber and to produce a light-green winter-forcing lettuce which will heart as well as existing varieties. By irradiating lettuce seeds, induced mutations have been brought about.

838 LAMM, R., HINTZE, S. & ÅVALL, H.
Klassificerande sort- och stamförsök med köksväxter 1955–1958. (**Classificatory trials of varieties and strains of vegetables, 1955-1958**).
Medd. Trädgårdsförs. 1959 : No. 121 : Pp. 22.

Included in this descriptive list of the strains and varieties awarded first class rank in the above trials, carried out at Alnarp and other Swedish stations, are Igloo OE/58, a new cauliflower derived from Stella Nova OE, and the dwarf marrowfat pea Sigyn/58. The former is a productive midseason variety of high quality; the latter, from a cross between Primus and an early marrowfat, is a small-seeded variety equalling Debut/48 in yield but 1–2 days later.

839 BJURMAN, B.
Lokala försök med blomkål och bönor 1952–1954. (**Local trials of cauliflower and beans, 1952-1954**).
Medd. Trädgårdsförs. 1959 : No. 124 : Pp. 18.

In trials held mainly in northern Sweden, the midseason strains Stor Dansk W:s/47 [Large Danish W:s/47] and Stor Dansk OJO/50 were the best of seven cauliflowers. Of five green-podded dwarf slicing beans, the early variety Regent OE/53 gave the highest yield, while of the seven wax-podded dwarf beans none was particularly suited to the area.

840 RUCK, H. C., ECONOMIDES, C. V., MYRIANTHOUSIS, T. S. & ORPHANIDES, J.
Annual Report of the Department of Agriculture, Cyprus for 1958.
Annexure III. Horticulture Pp. 24. (Mimeographed).

The results of trials of tomatoes, musk melons and water melons are reported in detail. Pearson appeared to be a very satisfactory tomato; both the Pearson strains tested were superior to other varieties in yield of healthy fruit. Also Pearson has large fruit which markets well but is unfortunately rather late in ripening. Of the musk melons, Ananas Yokneam appeared to be superior in yield and taste, coming second in appearance, but it is only suitable for local consumption. Honey Dew types seemed to be most satisfactory for export purposes. Malali Improved was the outstanding water melon as regards yield, flavour and appearance. Testing of other fruits is also under way.

841 HAHN, P. & MILDNER, E.
Neue Gemüsesorten, die 1959 in die Sortenliste der Deutschen Demokratischen Republik aufgenommen wurden. (**New vegetable varieties which were admitted to the variety list of the German Democratic Republic in 1959**).
Dtsch. Gartenbau 1959 : **6** : 185–89.

Sweet pepper. Pussta is a new vegetable variety resembling Chanca in growth habit and fruit form but the fruit is rather darker, smoother and more fleshy. This variety is good for stuffing and for use in salads and it gives a consistently high yield. Pussta ripens early. Sonja is said to be a "tomato pepper" which is particularly suitable for salads. It gives a yield 10% higher than that of Sonnenkind [Sun Child] and is also about four days earlier. The fruits of Sonja are bright red when fully ripe and the flesh is thick and very juicy.
Radish. Chrestensens Bicolor produces a very early crop ripening before Voran and Primus and is suitable for cultivation in cold frames. The oval roots are two thirds carmine red and one third white. Cracks hardly ever occur in this variety. Wagners Global has white rounded roots with tender flesh; these retain their good quality for some time and their weight is good. Wagners Global is an early radish suitable for growing in cold frames.
Leek. Bördeperle [Börde Pearl] is a high-yielding leek resistant to bolting; the outer scales are easily removed and the flesh is white and firm.
Cauliflower. Wartburgland is an early variety rather similar to Erfolg [Success] in form but the curd is heavier than that of Erfolg and opens out less quickly. Wartburgland is of good quality.
Lettuce. Wagners Signal is an early cabbage lettuce rather similar to Victoria Freiland [Victoria Out-of-door]. This variety is suitable for cultivation under glass and in the open. The weight of the head is almost equal to that of Maikönig [May King]. Dickkopf (weissamig) [Ballhead (white-seeded)] is an improvement on the original Dickkopf which has black seeds. The new variety has particularly large and heavy heads. Format is a Crystal variety with finely curled leaves. It is particularly suitable for summer cultivation and develops slowly, giving a late harvest of heads which are above average in weight. Unlike other Crystal varieties, Format gives a good yield of seed.
Tomato. Primavera is particularly suitable for cultivation under glass. The yield is good

and also early and the fruit is of high quality. Primavera surpasses Vollendung [Completion] in all important characters.

Bean. Saxonova is a dwarf variety of the Saxa type; it is superior to Saxa in its resistance to anthracnose and in its yielding ability. Quedlinburger Speck [Quedlinburg Bacon] is a climbing bean rather similar to Islebia but superior in quality; the pods of the new variety are straight and between 19 and 21 cm. in length. This variety is only slightly attacked by anthracnose.

Mushroom. Schneeköpfchen [Little Snowhead] produces a pure white cap and is recommended for cellar cultivation. Braunschopf [Brown Crown] is a very firm variety which may be grown at rather higher temperatures in rooms and glasshouses; it yields well. Cremeling is suitable for cellar and glasshouse cultivation and gives a good yield.

842 SHARMA, A. K. & BHATTACHARYYA, N. K.
Further investigations on several genera of Umbelliferae and their interrelationships.
Genetica 1959 : **30** : 1–62.

Observations on chromosome number and morphology are presented for the following species and varieties: *Petroselinum sativum*, $2n = 22$; *Seseli indicum*, $2n = 42$; *Ammi majus*, $n = 11$; *Pastinaca sativa*, *Selinum tenuifolium*, *Foeniculum vulgare*, *Apium graveolens* and *Coriandrum sativum* 'Madras', $2n = 22$; *Pimpinella diversifolia*, *Daucus carota* 'Farakkabad' and 'Nantan' and *Hydrocotyle asiatica*, $2n = 18$; *H. rotundifolia*, $2n = 24$; *H. javanica*, $2n = 72$; and *Oenanthe thomsoni* and *Oe. benghalensis*, $2n = 20$. These together with previous records show that several series of numbers may be found within a single genus, indicating that the different series can be derived from one another. However, caryotypes within a genus show certain similarities with only minor differences between species, and caryotype analysis may thus be useful in taxonomic studies. *Ptychotis* is regarded as having the most primitive caryotype, with six pairs of large symmetrical chromosomes, and it is suggested that *Petroselinum* and *Seseli* with their similar caryotype but different number, form an evolutionary line derived from this genus. A second line, characterized by a diminution in chromosome size, is represented by *Carum*, *Pastinaca*, *Peucedanum*, *Selinum* and *Foeniculum*; and a third line, showing the evolution of asymmetrical chromosomes, by *Coriandrum*, *Apium*, *Pimpinella* and *Cuminum*. *Daucus* and *Oenanthe* both have very small chromosomes and are regarded as members of the same tribe. In both these genera structural hybridity is suggested by the occurrence of a pair of heteromorphic chromosomes. On the basis of secondary associations, six is regarded as the basic number in *Hydrocotyle*.

843 NIEDIECK, B.
Eine Schnellmethode zur Gesamtoxalatbestimmung in Blattgemüsen. **(A rapid method for total oxalate determination in leaf vegetables).**
Züchter 1959 : **29** : 184–85.

A simple method based on those of Baker and Pereira is described.

844 **(The beetroot Nesravnennaja A 463).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. **6** : p. 26. [Russian].

Nesravnennaja A463 [Incomparable A463] was bred at Gribovo. It ripens in midseason and has round roots with good flavour and darkly pigmented flesh including the concentric rings. The variety is valuable for early maturity of the seed heads.

845 FRANKLIN, D. F.
Idaho will benefit doubly from development of hybrid carrots.
Idaho agric. Sci. 1959 : **44** : No. **3** : p. 1.

The possibility of the development of hybrids, with a more uniform colour, size and shape, a higher vitamin and carotene content, higher yields, reduced core size and increased core tenderness and less susceptibility to growth cracks and early bolting than present varieties, is briefly mentioned.

846 SHINOHARA, S.
(The virus resistance of radishes of the Shogain type).
Nogyo oyobi Engei/Agric. & Hort. 1958 : **33** : 87–90. [Japanese].

Tests of radish varieties at the Shizuoka research station for resistance to virus are reported and descriptions are given of three promising virus-resistant varieties: Kunitomi [Country's Wealth], from Banseishogain [Late Shogain] x Wasenennai [Early in the Year], Konoshogain [High Agriculture Shogain], from Waseshogain [Early Shogain] x Banseishogain, and Takagamine.

847 ERICKSON, H. T.
Bulb onions from seed—an evaluation of hybrids and varieties for Indiana.
Res. Bull. Purdue Univ. 1959 : No. 672 : Pp. 8.

Results of variety trials during 1956–1958 are given. Elite is the most superior all-round variety, though Trapp's Downing Yellow Globe is best for long storage.

848 **Develop onion hybrids resistant to pink-root.**
Iowa Fm. Sci. 1959 : **14** : p. 329.

By utilizing an inbred line resistant to *Pyrenochaeta terrestris*, new forms of the hybrids Spartan, Epoch and Bonanza, resistant to this pathogen, have been obtained.

849 YEN, D. E.
Pollen sterility in Pukekohe Longkeeper onions.
NZ J. agric. Res. 1959 : **2** : 605–12.

Tests of the progeny of bulbs of the variety Pukekohe Longkeeper indicate the presence of the cytoplasmic factor *S* and the recessive factor *ms* for pollen sterility. There is some evidence that the related varieties Rangitikei Red and Straw Spanish also have these factors for pollen sterility.

850 BATURIN, B. V.
(Utilizing a refractometer in the selection of forms of onion suitable for keeping).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 6 : 63–65. [Russian].

In biochemical studies of onions at Birjučij Kut, positive correlations were found between (1) high dry-matter content and high sugar content, (2) high dry-matter content and high ratio of sucrose : monosaccharides and (3) high dry-matter content and good keeping quality. Using a refractometer, material with good keeping properties was selected among several hybrids between southern onion varieties and pungent northern varieties. The selections transmitted good keeping quality to their progeny, but the progeny showed a reduction in yield and number of large bulbs. For instance, the progeny of hybrid 176 (Kaba x Balakleja) produced only 8% of large bulbs with a dry-matter content exceeding 13%. Hybrid 206 (Meterskij x Ispanskij [Spanish]), on the other hand, had a fairly high proportion of large bulbs, 58%. The method of selection was subsequently modified to include selection of high-yielding material with large bulbs.

851 BERRY, S. Z.
Resistance of onion to downy mildew.
Phytopathology 1959 : **49** : 486–96.

Italian Red 13–53, which is resistant to *Peronospora destructor*, was compared with the susceptible inbred line Brigham Yellow Globe 2215 and ten other susceptible strains and varieties. No association was found between the resistance and structure of the bloom and epidermis, stoma number and size, water deposit on the plants or contact angle. Once infection was initiated in Italian Red 13–53, mycelial growth was less than in any of the other 11 forms. Resistance was found to be due to two interacting causes. The first was the external resistance level expressed by the spore load necessary for infection. The second was inhibition of the pathogen following the establishment of infection.

852 LALL, B. S. & VERMA, S. K.
Variability of resistance in the onion varieties against the onion thrips, *Thrips tabaci* (Lind.) Thripidae: Thysanoptera.
Sci. & Cult. 1959 : **24** : 575–76.

In addition to the local variety, Madras, Country White, Bombay, Spanish White, Poona Red, Patna and Giant Red have been tested for resistance to *T. tabaci* at Bihar Agricultural College, Sabour. The average number of thrips per plant on the most susceptible variety, Poona Red, was 37·90 compared with 13·26 on the most resistant variety, Spanish White. The resistance of the latter appears to be associated with the loose arrangement and light green colour of the leaves and, conversely, the susceptibility of Poona Red seems to be connected with the compact arrangement and deep green pigmentation of the leaves.

853 YAMADA, Y.
(Studies on the varietal improvement of *Allium* plants. I. On the modes of propagation in *Allium* plants. II. On the structure of the bulb undergoing multiplication and the differentiation of the flower buds in *A. bakeri*).
Saga Daigaku Nogaku Iho/Agric. Bull. Saga Univ. 1957 : No. 6 : 35–59. [Japanese].

The first paper briefly describes the methods of reproduction (flowers, aerial bulbils and underground bulbs) in 12 different species. The second deals at greater length with the formation of daughter bulbs in *A. bakeri.*

854 KADRY, A. EL R. & KAMEL, S. A.
Morphological studies in *Allium kurrat* Schweinf., *A. porrum* L. and their hybrid.
Svensk bot. Tidskr. 1959 : **53** : 185–99.

The F_1 hybrid was fertile and intermediate between the parent species in many morphological characters. Bulbils were formed only on *A. porrum* and the F_1 plants. On grounds of morphology, it is suggested that *A. porrum* and *A. kurrat* may be regarded as a single species or two closely related ones.

855 KOROHODA, J., WAKSMUNDZKI, A. & WOLTER, J.
Wstępne badania nad zastosowaniem metody chromatografii bibułowej dla rozpoznawania odmian botanicznych w obrębie gatunku *Brassica oleracea* L. **(Preliminary studies on the application of the paper chromatography method to the identification of botanical varieties within the species *B. oleracea* L).**
Roczn. Nauk rol. : Ser. A 1958 : **78** : 683–95.

Germinating seeds of *B. oleracea* vars. *capitata* f. *alba, capitata* f. *rubra, sabauda, gemmifera, botrytis, gongylodes* and *acephala* showed quantitative differences in aminoacids. The varieties could thus be distinguished by means of appropriate chromatographic treatment.

856 MINKOV, I.
(Work on the improvement of the cabbage variety Pazardžikskaja Krasnaja).
Ovoščarstvo i Gradinarstvo (Fruit & Vegetable Culture) 1958 : No. 10 : 33–36 : from Ref. Bjull. bolg. naučn. Lit. (Ref. Bull. Bulg. sci. Lit.) 1959 : No. 1 : Abst. 65 : p. 41. [Bulgarian].

Mention is made of four new red-cabbage strains selected from the above land variety. They have a good flavour when eaten as salad or sauerkraut.

857 ŽEČEVA, Ž.
(The results of work on the improvement of some late cabbage varieties).
Nauč. Trud. nauč.-izsled. Inst. zelenč. Kult. Marica (Sci. Trans. Marica sci-res. Inst. veg. Cult.), Plovdiv 1957 : **1** : 61–84 : from Ref. Bjull. bolg. naučn. Lit. (Ref. Bull. Bulg. sci. Lit.) 1958 : No. 1 : Abst. 28 : p. 19. [Bulgarian].

Descriptions are given of three cabbage varieties selected at the Marica institute. All of them are high-yielding varieties with growth periods of about 115–130 days; they form good heads with a vitamin C content of over 40·23 mg. %. Likoriško 7 is drought resistant.

858 RUBIN, B. A. & IVANOVA, T. M.
(The role of aminoacid oxidases in the immunity of cabbage to *Botrytis cinerea*).
Biohim. Plod. Obošč. (Biochem. Fruit Veg.) 1959 : No. 5 : 113–32. [Russian].

Thecabbages No. 1, an early variety susceptible to storage rot, and Amager, a late, resistant variety, were infected with *B. cinerea* and extracts from them were analysed by paper chromatography. The content of basic aminoacids and of glycine, alanine and serine was higher in the extracts of the resistant variety. Observations on discs of tissue showed the capacity to oxidize certain aminoacids to be greater in Amager; the oxidase activity was highest in the vicinity of the infection; ammonia could be detected in this zone, which also had a higher peroxidase activity. Toxin extracted from the fungus had a similar effect to mycelial infection.

859 COYNE, D. P.
Physiological differences in celery varieties in relation to pithiness.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–118 : 2207–8. (Abst.).

Varieties which became very pithy in storage at 32° F. underwent significant decreases in fresh and dry weights of the petioles, the decline in fresh weight being largely due to loss of moisture. No association was found between soluble solids content of the plant and degree of pithiness. The tissue cellulose of the outer and inner petioles of different varieties when fresh was analysed. The intrinsic viscosity was lower and the percentage of the cellulose significantly higher in pithy outer petioles of Emerson Pascal than in nonpithy inner petioles of this variety or in nonpithy outer and inner petioles of Utah 15. In general, the respiration rate among different varieties was significantly higher in very pithy petioles than in nonpithy and slightly pithy petioles. It is suggested that the increase in respiration rate may be attributed to loss of respiratory control as cell senescence begins in pithy petioles. Utah had significantly smaller cells than Summer Pascal and Emerson Pascal. Small cell size may possibly be useful as a criterion for selecting for resistance to pithiness.

860 Fujishita, N.
(Studies on the sex of melon flowers. I. The genetics of the andromonecious and monecious types of melon and the functioning of the pollen in hermaphrodite and male flowers).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1959 : **28** : 39–44. [Japanese].

One andromonecious variety, Earl's Favourite, and two monecious varieties, 111, an Afghan snake melon, and 981, from Pakistan, were used. A study of the F_1–F_2 of hybrids between the two sexual types showed that monecy *v.* andromonecy is determined at a single locus, monecy being dominant. Within andromonecious plants, pollen from hermaphrodite flowers germinates rather better than that from male flowers. Selfing hermaphrodite flowers gives a good seed set and is of practical value for inbreeding.

861 Mortensen, J. A.
The inheritance of Fusarium resistance in muskmelons.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–132 : p. 2209. (Abst.).

The layer and stem-injection methods proved superior to other greenhouse techniques of inoculating with the pathogen causing *Fusarium* wilt. Resistance was dominant to susceptibility in all crosses. The hypothesis of a principal dominant gene for resistance plus two complementary dominant genes fitted all the data obtained and offers an explanation of apparent inconsistencies in the results reported by previous investigators. According to this hypothesis, the complementary genes *A* and *B* produce a resistant phenotype in the absence of the chief gene, *R*.

862 Georgiev, P. H. & Alipieva, M.
(Some local populations of water melon in North Bulgaria).
Ovoščarstvo i Gradinarstvo (Fruit & Vegetable Culture) 1957 : No. 12 : 27–30 : from Ref. Bjull. bolg. naučn. Lit. (Ref. Bull. Bulg. sci. Lit.) 1958 : No. 1 : Abst. 26 : p. 18. [Bulgarian].

Eight land varieties distinguished by fine flavour, earliness and good transportability are cited.

863 Bianchi, A. & Marchesi, G.
Primi risultati nel programma di produzione di angurie poliploidi. **(First results in the programme of producing polyploid water melons).**
Ann. Fac. Agr., Milano : Ser. 6 1958 : No. 3 : 73–77.

Seeds of *Citrullus vulgaris* 'Charleston Gray' were treated with 0·2% colchicine for 20 hours and then with a 0·3% solution for 3–4 days. Those from the longer period failed to give mature plants; two of the 13 plants obtained from the other treatment bore fruits with triploid seeds, in one case mixed with tetraploid, in another with occasional hexaploid seeds. It was not possible to distinguish the polyploid seeds from the diploids morphologically.

The triploid seeds are expected to give rise to plants bearing seedless fruits.

864 Torres, J. P.
The seedless watermelon has come to stay in the Philippines.
Araneta J. Agric. 1956 : **3** : No. 4 : 48–50.

Seedless-fruited triploid hybrids, produced by crossing female tetraploids with male diploids, are being produced in the Philippines.

865 Skripnikov, Ju. G.
(A new form of pumpkin).
Agrobiologija (Agrobiology) 1958 : No. 6 : 137–38. [Russian].

Hybrid 13 was obtained by open pollination of *Cucurbita pepo* 'Mozoleevskaja 46'/*C. maxima* 'Stolovaja Zimnjaja A5' [Table Winter A5], the seed progeny being raised from the stock. The hybrid has a short growth period and is productive of high quality fruit in Tambov. Families with a yield of 400 c. per ha. and a dry-matter content of 15–26% have been selected.

866 Mihov, A.
(New varieties of *Cucurbita moschata* Duch.)
Nauč. Trud. nauč.-izsled. Inst. zelenč. Kult. Marica (Sci. Trans. Marica sci-res. Inst. veg. Cult.), Plovdiv 1957 : **1** : 137–54 : from Ref. Bjull. bolg. naučn. Lit. (Ref. Bull. Bulg. sci. Lit.) 1958 : No. 1 : Abst. 32 : p. 21. [Bulgarian].

Five new varieties with pear-shaped fruits have been selected from Bulgarian land races. The best of these are 51–17 and 51–27 which have growth periods not exceeding 130 days and yield up to 44 tons of fruit per ha. They are rich in carotene and their flavour is good.

867 Weiling, F.
Genomanalytische Untersuchungen bei Kürbis (*Cucurbita* L.). **(Analytical investigation of the genome in *Cucurbita* L.).**
Züchter 1959 : **29** : 161–79.

Cytological investigations of *C. maxima*, *C. pepo*, *C. ficifolia*, *C. moschata*, *C. mixta* and the F_1 hybrids *C. maxima* x *C. pepo*, *C. pepo* x *C. maxima*, *C. maxima* x *C. ficifolia*, *C. mixta* x

C. pepo and *C. maxima* x *C. moschata* are reported in detail. The chromosomes of the different species did not differ greatly in size and form, and almost all the chromosomes paired at metaphase I. There was some variation within species in the number of chiasmata per PMC and the number of chiasmata per paired chromosome. Also significant differences were found between and within hybrids in the number of univalents and chiasmata formed. Some multivalents were also observed; the F_1 of *C. maxima* x *C. moschata* was outstanding in this respect. Differences were observed between hybrids in the maturation divisions; *C. maxima* x *C. ficifolia* showed a relatively high proportion of monads and *C. maxima* x *C. moschata* a relatively high proportion of dyads. From the observations made and from calculations using Gaul's formula [cf. XXV, 907] the number of chromosomes capable of pairing appeared to be 40 in all the hybrids except *C. maxima* x *C. ficifolia* where the corresponding number was 20. The pairing is allosyndetic.

It is concluded that *C. maxima, C. pepo, C. moschata* and *C. mixta* have the genomes AABB and *C. ficifolia* has AACC. The genomes A, B and C are not thought to be homologous. It is suggested that the wild species *C. lundelliana* has the genomes AAWW, W showing affinity to B and C.

868 Markova, S.
(The All-Union Inspection of Vegetables).
Nauk. pered. Opyt. sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 10 : 35–40. [Russian].

Among the exhibits at the Moscow Agricultural Exhibition were high-yielding hybrid varieties of cucumber bred at the Institute of Plant Industry. VIR1 [Institute of Plant Industry 1] (Klinskij 2137 x Leningradskij Tepličnyj 23 [Leningrad Greenhouse 23]), with a yield of up to 26 kg. per m.², was the most productive of these, but the yields of VIR2 (Leningradskij Tepličnyj 23 x Klinskij 2137) and VIR3 (Klinskij 2137 x Dlinnoplodnyj 1294 [Long-fruited 1294]) were only a little below VIR1.

869 Mihov, A.
(The question of studying heterosis in the cucumber and the method of producing heterotic seed).
Nauč. Trud. nauč.-izsled. Inst. zelenč. Kult. Marica (Sci. Trans. Marica sci.-res. Inst. veg. Cult.), Plovdiv 1957 : **1** : 117–33 : from Ref. Bjull. bolg. naučn. Lt. (Ref. Bull. Bulg. sci. Lit.) 1958 : No. 1 : Abst. 31 : p. 20. [Bulgarian].

Hybrids exceeding their parents in earliness and yield have been bred at the Marica institute. It was found that open pollination could be used as an easy and quick method of producing hybrid seed.

870 Nagaeva, N.
(The cucumber variety Pavlovsk 1822).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 6 : p. 70. [Russian].

Pavlovsk 1822 was selected from a local strain at the Verhnjaja Hava Horticultural Research Station, Voronež province. It produces cylindrical fruits of crunchy consistency, with good salting properties. It outyielded Nežinskij Mestnyj [Local Nežin], a standard in the Voronež province, by 70–100 c. per ha. at Verhnjaja Hava.

871 Marchesi, G.
Confronti fra cultivar di pomodoro (Sperimentazione collegiale anno 1957 e triennio 1955–56–57). **[Comparisons of tomato cultivars (Collective experiments in 1957 and the three-year period 1955-57)].**
Ann. Fac. Agr., Milano 1958 : **66** : 175–226.

Tests carried out near Rome with 23 cultivars showed that those with the highest yield had a higher acidity, lower sugar content and lower quality. The varieties giving the best combination of yield, composition and resistance to *Alternaria solani* and *Septoria lycopersici* are enumerated.

872 Jensen, J.
Forsøg med sorter og stammer af frilandstomater 1954–57. **(Trials of varieties and strains of open-air tomatoes, 1954-57).**
Tidsskr. Planteavl 1959 : **63** : 45–60.

Details of yield, earliness and quality are given for 11 bush tomatoes and 14 of indeterminate growth, tested at four stations in Denmark. Five of the first and six of the second group are approved and briefly described.

873 Stevenson, E. C., Johnson, K. W. & Tomes, M. L.
Performance of processing tomato varieties in Indiana, 1956-1958.
Res. Bull. Purdue Univ. 1959 : No. 684 : Pp. 11.

The varieties Purdue 1361, Rutgers, Urbana, Improved Garden State, Kokomo, Homestead 2 and Rutgers x Pritchard F_2 hybrid were compared for yield, earliness, disease resistance and quality of fruit at several localities in Indiana. Some new varieties, Stair, Tecumseh, Roma and Mozark, have also been tested for one or two years.

874 Nakagawa, H.
(The cultivation of tomatoes without staking in the cool field-crop zone).
Nogyo oyobi Engei/Agric. & Hort. 1958 : **33** : 270–74. [Japanese].

Further data are provided on the productivity of Japanese and American varieties grown without staking. Descriptions are given of five varieties especially suitable for this method of cultivation [cf. XXVIII, 4836].

875 Lefort, M.
Étude de quelques mutants chlorophylliens induits chez *Lycopersicon esculentum* Mill. **(Study of some chlorophyll mutants induced in *L. esculentum* Mill.)**
Rev. Cytol. Biol. végét. 1959 : **20** : 1–159.

When dry seeds were irradiated the total frequency of mutations was a linear function of the X-ray dose but not of the neutron dose. With soaked seeds, the frequency was much increased and the curves were linear only for the lower doses.

The *viridis* group of mutants included those plants with 50–70% of the normal chlorophyll content, the *xantha-viridis* group those with 25%, the *xantha* group those with about 4% and the *albina* group those with under 4%. The carotenoid contents of the last three groups were respectively 20–40%, up to 18% and 1–4% of the normal value. Electron microscope studies showed that the chloroplasts in *viridis* types corresponded in structure to young normal chloroplasts and those in the *xantha* types to the very young chloroplasts occurring in meristems; those in the *albina* types were without any clear structure and had no lamellae.

876 Nazarov, S. P.
(Vegetative hybridization by coalescent fruits).
Nauk. Zap. Nižyn. derž. ped. Inst. (Sci. Mem. Nižyn St. ped. Inst.) 1956 : **7** : 38–52 : from Ref. Ž. (Ref. J.) 1958 : No. 12 : Abst. 52449 : p. 35. [Russian].

The seed progeny of coalescent fruits of different tomato varieties showed variability in plant height, leaf characteristics and the colour of the ripe fruits.

877 Petrahilev, I. M.
(The Murom tomato).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 12 : 148–50. [Russian].

Murom [Danish Export x Gribovo 01180] was bred at the Murom Horticultural Nursery. It is tolerant of low temperatures at the initial growth stages and is resistant to frost. The first fruits ripen in July; the rest are gathered before 1 September. The yield is of the order of 250–300 c. per ha. and the fruit has good flavour and transports well.

878 Byhanova, K. E.
(The tomato variety Stalingrad 5/95).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 5 : p. 32. [Russian].

Stalingrad 5/95 (Kuban' x Hybrid 175) was bred at the Stalingrad Horticultural Research Station. It ripens late, is resistant to diseases and high temperatures and has a firm skin and high dry-matter content.

879 **Research today and tomorrow.**
Report, Lafayette, Ind. 1958 : **1** : No. 3 : p. 15.

Developed at Purdue University, Stair, a new variety of tomato for canning, is high yielding, uniform in size, less susceptible to cracking than the present varieties grown and resistant to *Fusarium* wilt.

880 Daubeny, H. A.
Factors contributing to earliness in tomato breeding, with special reference to ability to set fruit at low temperatures.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–972 : p. 2423. (Abst.).

Field trials carried out at Ithaca, NY, revealed that Puck, Fireball, Red Cloud and the Cornell breeding lines 54–149 and 54–179 are early in flowering, fruit set and ripening. These lines and others set fruit at night temperatures lower than the limiting temperatures reported for most commercial varieties. The earliness characters of Puck were dominant in crosses with the later varieties Earliana, John Baer and Rutgers. Varietal differences in pollen germination and style elongation at low temperatures are thought to affect the fruit set. All the varieties studied produced an abundance of viable pollen at low temperatures. Selection for early flowering was found to be the most efficient method for selecting early segregates.

881 Manunta, C.
La ricchezza in vitamine nei pomodori. **(The vitamin content of tomatoes).**
Genet. agr. 1959 : **10** : No. 1–2 : 17–32.

In crosses of *Lycopersicon esculentum* with *L. hirsutum* and *L. pimpinellifolium* the content of β-carotene in the F_3 varied from 3·62 to 7·42% and that of lycopene from 0·3 to 2·5%, there being no correlation between the two. F_3 plants combining a β-carotene content of 4·52% with a vitamin C content of 40·00 mg.%

and a low lycopene content (0·54%) were selected in the F_3 of a cross of Comet x *L. hirsutum* and the F_4 results suggest that it should be possible to select lines combining high contents of provitamin A and vitamin C.

Data are presented showing the vitamin C contents of a number of tomato cultivars grown in Italy; the values varied from 22 to 32 mg.% in the table varieties and from 21·28 to 36·60 mg.% in varieties used for peeling. The content of provitamin A varied from 0·12 to 0·58 mg.%. In F_1 hybrids between cultivars the values for vitamin C, and also for lycopene and β-carotene, were never below that of the lower parent and tended to approach that of the higher parent, sometimes exceeding it.

In interspecific crosses, the highest contents of vitamin C (45 mg.%) were found in hybrids of *L. pimpinellifolium* and the highest contents of provitamin A in hybrids of *L. hirsutum*. An inverse correlation was observed between provitamin A and β-carotene content, but some selections had distinctly higher values of β-carotene than those found in the varieties in cultivation; one such selection of Comet x *L. hirsutum* had 1·50 mg.% of provitamin A, 45·6 mg.% of vitamin C and 12·00 mg.% of lycopene.

882 MANUNTA, C.
Studio comparativo delle caratteristiche biochimiche di varietà di pomodoro—da conserva, da pelati, da tavola—e di loro incroci anche con specie selvatiche del genere *Lycopersicum*. **(Comparative study of the biochemical characteristics of tomato varieties—for conserving, for peeling and for the table—and of their crosses, also with wild species of the genus *Lycopersicum*).**
Genet. agr. 1959 : **10** : No. 1–2 : 33–75.

Figures are given showing the dry-matter content (recorded refractometrically), acidity and content of reducing sugars in the juice of a number of Italian cultivars. Among the tomatoes for conserving, the best combination of the above characters and red coloration was found in the varieties Tondo Reatino [Rieti Round], Pancrazio, Barese, Paullo, Marmande and Prospero. Among the varieties for peeling, the best were various selections of Lampadina and Fiaschetto di Partinico. The best of the table varieties were Casaque Rouge [Red Pullover], Sunrise, Seelandia, Best of All and Comet. Similar observations on a number of inter-varietal hybrids showed the F_1 to be intermediate in most cases. There was a tendency for the hybrids to be lower than the lower parent in acidity. The following crosses gave hybrids superior in most respects to both parents: Marmande IBo. x Farthest North, Marglobe x Farthest North, Tondo Reatino x Superamande and Lampadina 7 x Barese. Good F_3 lines were obtained from the crosses VCIH7 x Puck and San Marzano x Carleton.

In crosses with *L. pimpinellifolium* several hybrids exceeded the parents in dry matter and reducing sugars; all the hybrids bore fruit of bright red colour but poor flavour; the content of vitamin C varied from 28·70 to 44·40 mg.%. The fruits are considered good for conserving, especially those of the hybrid Genovese x *L. pimpinellifolium*. The back cross of (Lampadina x *L. pimpinellifolium*) x Lampadina has a vitamin C content of 44·80 mg.%, provitamin A of 0·45 mg.%, combined with good size and colour, high sugars and low acidity and is considered suitable for preparation of juice.

Hybrids with *L. hirsutum* are mostly good in flavour; their acidity varies from 0·231 to 0·525, their sugar percentage from 1·81 to 4·27 and their vitamin C from 26·14 to 4·8 mg.%; some of the hybrids with up to 1·50 mg.% are higher than normal varieties in content of provitamin A and are thought to be suitable for both conserving and the preparation of juice; the hybrid of Comet x *L. hirsutum* is mentioned as being especially promising. Some hybrids thought to be useful for table use have also arisen in these crosses.

Data are given on the effect of different sowing times on the composition of the fruit. Some cultivars proved more sensitive than others.

883 ROMANCEV, N. D.
(For every tomato variety its own horticultural method).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 5 : **15–17**. [Russian].

The effects of removal of lateral shoots and spacing in plots 80 x 60 cm. and 80 x 30 cm. upon yield were studied at the West Siberian Vegetable Research Station, varietal differences in response to the treatments being noted. The removal of the laterals and the wider spacing increased the yields of Bison 639 and Gruntovyj Alpat'eva [Outdoor Alpat'ev]; in all other varieties with a similarly vigorous habit the treatments produced contrary effects. Data on fruit yields of eight varieties grown at different spacings are presented.

884 VITTUM, M. T., TAPLEY, W. T. & PECK, N. H.
Response of tomato varieties to irrigation and fertility level.
Bull. NY St. agric. Exp. Sta. 1958 : No. 782 : Pp. 78.

Over a five-year period John Baer proved to be most responsive to irrigation, closely followed by Red Jacket. Gem was least responsive. Red Top proved to be most responsive to extra fertilizer followed by Gem, Stokesdale and Red Jacket; John Baer was barely affected.

885 MÉSZÖLY, GY.
Paradicsomnemesítésünk helyzete és jövő feladatai. **(The state and further tasks of tomato breeding).**
Kertész. Kutató Int., Fertőd : Pp. 11 : from Hungar. agric. Rev. 1959 : **8** : No. 1 : p. 6.

In this report of work conducted at the Duna-Tisza Agricultural Experiment Station, Kecskemét, Hungary, it is noted that the varieties K363 and K42 have respectively proved suitable for canning and early field production, both in Hungary and elsewhere. In tests for disease resistance no resistant varieties were found, those which were resistant in other countries proving susceptible under Hungarian conditions. Crosses made with the aim of introducing resistance from wild species into cultivated varieties include K.3640 ♀ x *Lycopersicon peruvianum*, which has given one very early hybrid plant with a growing period of 83 days. *L. pimpinellifolium*, *L. hirsutum* and *L. humboldtii* have also been used as male parents in crosses. Tetraploid varieties obtained had a high content of vitamin C and some plants contained 36–40 mg./100 g. vitamin S. The chief disadvantages of the tetraploids are their low fertility and their susceptibility to virus diseases.

886 MARCHESI, G.
Osservazioni sulla resistenza a malattie in cultivar di pomodoro. **(Observations on resistance to disease in tomato cultivars).**
Genet. agr. 1959 : **10** : No. 1–2 : 76–88.

Observations on 24 cultivars in northern Italy showed Paullo, Pizzutello di Paceco and Prospero 39 to be the most resistant to *Alternaria solani* and Wheatley's Condine Red to *Septoria lycopersici*.

887 MARCHESI, G.
Primi risultati ottenuti da nuove linee di pomodoro. **(First results obtained from new lines of tomato).**
Ann. Fac. Agr., Milano : Ser. 6 1958 : No. 3 : 78–90.

The F_2, F_3 and F_4 generations of some hybrids obtained from West Springfield, Mass., USA, were subjected to selection in the vicinity of Rome. Five selections were compared in 1957 with the cultivar Sunrise; only one was superior in yield of fruits; in refractometric reading the selections were equal to the control or inferior, in sugar content equal, and in acidity one selection was higher, two equal and two lower. All five selections were more resistant to *Alternaria solani* and *Septoria lycopersici*. The best combination of all the above features was found in line 56–322.

888 DVORECKAJA, E. I., PYRINA, I. G. & FEOKTISTOVA, O. I.
(The question of the physiological nature of resistance to leaf mould in tomato plants).
Biohim. Plod. Obošč. (Biochem. Fruit Veg.) 1959 : No. 5 : 165–94. [Russian].

Measurements of respiration rate in the leaves showed it to be higher in *Lycopersicon pimpinellifolium*, which is resistant to *Cladosporium fulvum*, than in the susceptible variety Bison; a hybrid between the two was intermediate. The peroxidase activity was lowest in the resistant species and highest in Bison, the hybrid again being intermediate. The polyphenoloxidase activity was generally higher in the resistant forms.

Toxic extracts prepared from infected leaves caused wilting in the leaves of Bison more rapidly than in leaves of resistant species and hybrids. The toxin caused a marked reduction in the polyphenoloxidase activity in Bison and an increase in *L. pimpinellifolium*; peroxidase activity and repiration rate were increased by toxic extracts from artificial cultures of the fungus.

The physiological changes occurring in infected plants are described.

889 FERRINGER, E. C.
Dwarf tomatoes.
Report, Lafayette, Ind. 1958 : **1** : No. 4 : 3–4.

It is hoped that, with the introduction of dwarf tomatoes, partly or fully mechanized harvesting will be possible. Five pedigree lines, selected from crosses between Dwarf Stone and certain wilt-resistant varieties, which included Indiana Baltimore and Rutgers, are being tested at Purdue University Agricultural Experiment Station. They have short, compact vines which makes picking easier, the fruits ripen more or less together so they can be harvested in one or two pickings, and single-picking yields of approximately 12 tons per acre have been obtained. The plants are wilt resistant and fruit rots do not appear to be as frequent as on standard varieties.

890 **(The egg plant variety Delikates).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 5 : p. 32. [Russian].

Delikates [Delicacy] was bred at Krasnodar. It ripens early and bears fruits weighing 60–150 g.

891 BUDVITENE, V.
(Broad bean—a promising crop in the Lithuanian SSR).
Zemledelie (Agriculture) 1958 : No. 11 : 48–51. [Russian].

Mention is made of 25, 41–2 and other high yielding *Vicia faba* varieties bred at the Lithuanian Institute of Agriculture.

892 GHARE, M. M. & THAKRE, J. S.
"Sindkheda 1-1" an "improved variety of udid".
Poona agric. Coll. Mag. 1959 : **49** : 232–34.

Selected from a collection of *Phaseolus mungo* made in the district of West Khandesh, Sindkheda 1–1 has outyielded Local by 10–12%.

893 BALLON, F. B. & YORK, T. L.
Crossing the common and scarlet bean (*Phaseolus* spp.) with Vigna species.
Philipp. Agric. 1959 : **42** : 454–55.

The attempt to cross *V. sesquipedalis* and the varieties ACS (*V. sinensis* 'Alabama Crowder' x *V. sesquipedalis*) and BCS (*V. sinensis* 'Brown Crowder' x *V. sesquipedalis*) as female parents with *Ph. coccineus* and *Ph. vulgaris* failed. The growth of the *Phaseolus* pollen tubes was retarded in the *Vigna* styles. In selfings of *V. sinensis*, the tubes reached the ovules 6 hr. after pollination. The retardation in the intergeneric crosses may have been due to the high temperature at noon, which coincided with the end of the 6-hr. period, or it may have been due to inhibition by an ovarian secretion.

894 CAMPBELL, J. A.
Longval is new bean for fresh market and gardens.
Miss. Fm. Res. 1959 : **22** : p. 1.

[Cf. XXIX, 3246].

895 **New mungbean released.**
Crops & Soils 1959 : **11** : No. 10 : p. 28.

Kiloga, bred at the Oklahoma Agricultural Experiment Station, was selected for its desirable bean size, this being intermediate between that of Oklahoma 12 and Jumbo. Kiloga yields as well or better than Oklahoma 12; it is taller than this variety and easier to combine. Kiloga is of medium-early maturity. It was developed from the experimental strain Purdue 3.

896 **New bean getting commercial test.**
Idaho agric. Sci. 1959 : **44** : No. 3 : p. 1.

Red Mexican UI–35, now undergoing extensive field trials, is mosaic resistant and a few days earlier than the Red Mexican varieties now grown.

897 TEDORADZE, S. G.
(New *Phaseolus* varieties from Georgia).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 6 : 57–59. [Russian].

Recent selections from the Georgian Breeding Station include two bush types of French bean, Muhranula 4 and Čiaturis 52. The former, grown for seed, ripens 8–10 days earlier than the general-purpose type Canava 3 and yields 3·7 to 4·6 c. more seed per ha; it is resistant to drought and diseases, has a protein content of 24·6% and its cooking quality and flavour are good. Čiaturis 52, grown for its pods, yields 17·2 c. more pods and 0·8 c. more seed than the standard variety, is rich in vitamin C and protein and shows resistance to fungi. Its cooking quality is good.

898 INOUE, Y. & SUZUKI, Y.
(Studies on the reproductive physiology of the French bean. VII. The effects of temperature on the functioning of the pollen and pistil of the French bean).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1959 : **28** : 19–22. [Japanese].

The variety Masterpiece was used. The pistil can be fertilized from 3 days before anthesis. Growth of pollen down the style was at a maximum in the temperature range 15–25° C.;

the pistil was receptive throughout a temperature range of 15–40° C. 4 hours before pollination.

899 Ghare, M. M., Thakare, J. S. & Patil, P. D.
Occurrence of sterility in *Phaseolus mungo* (*udid*).
Curr. Sci. 1959 : **28** : p. 251.

A form in which protrusion of the style prevents self pollination has been found at the Agricultural Research Station, Jalgaon, East Khandesh. It is under genetical investigation.

900 Tasaki, J.
(On the influence of Föhn weather on pollen germination of *Phaseolus angularis*).
Nogyo Kisho/J. agric. Met. 1959 : **14** : 91–95. [Japanese].

Percentage pollen germination deteriorates under Föhn weather conditions. It appears that the factors responsible for this decline are low atmospheric humidity and high temperature prior to flowering.

901 Wallace, D. H.
The relationship of yielding ability to dry matter accumulation and its distribution for several varieties of dry bean, *Phaseolus vulgaris* L.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–698 : p. 2437. (Abst.).

Records were made of the dry weight of the aerial shoot and the parts, stem, leaf and fruit, throughout four seasons for seven varieties; these included two of the marrow type differing in yielding ability, two yellow-eye beans, two pea types and one red-kidney bean. In leaf area there were significant differences both within and between types but significant differences in net assimilation rate were observed only between types. Within each type, the variety with the greatest leaf area usually gave the highest yield. Varieties differed in the ratio, leaf area/total dry weight. There were also varietal differences in the percentage of the dry weight at maturity contributed by fruit, seed and pod wall. The marrow strain 7–16 which outyields all the commercial varieties grown in New York has a very high proportion of seed, a very low proportion of the fruit being pod wall. Changes in the dry weight of the embryo axis during germination were investigated in three varieties; the variety with the largest initial embryo axis had the lowest relative growth rate and consequently the smallest seedling size. These factors did not appear to contribute to yield differences. Seed size influenced the dry weight of seedlings but had no effect upon yield. There was some evidence that the high yield of 7–16 may be due to a greater translocation of dry matter from the leaves just before their abscission at maturity. The inverse relationship between net assimilation rate and leaf area indicates that neither of these characters are useful as a selection index in breeding for higher yields. However it should be advantageous to know the relative level of these factors in parental lines, for segregation may result in favourable combinations with higher yields.

902 Rodrigues, C. J. (Júnior)
Raças fisiológicas de *Uromyces appendiculatus* (Pers.) Link. **[Physiological races of *U. appendiculatus* (Pers.) Link].**
Agron. lusit. 1955 : **17** : 263–74.

Six physiological races (1–6) have been differentiated in 45 samples from Portugal, Madeira and S. Tomé. The reactions of a large collection of Portuguese French-bean cultivars to these races was ascertained. Most varieties are susceptible.

903 Natti, J. J.
A systemic disease of beans caused by a tobacco necrosis virus.
Plant Dis. Reptr. 1959 : **43** : 640–44.

A systemic disease of *Phaseolus vulgaris* was found to be caused by tobacco necrosis virus and probably identical with stipple streak disease of beans found in Holland. All of 67 varieties inoculated were susceptible, but no symptoms were found on several varieties of other leguminous plants tested.

904 Zaumeyer, W. J. & Thomas, H. R.
Tendercrop, a new slender-podded snap bean.
Seed World 1959 : **84** : No. 6 : 8–10.

Tendercrop was developed jointly at the US Experiment Station, Greeley, Colo., and Idaho Branch Experiment Station, Kimberley, from Topcrop x Tenderpod. Resistant to common bean mosaic, New York 15 mosaic and a pod-mottle virus, it has dark green, slender pods, purple mottled seeds, wide adaptability and suitability for processing, particularly for freezing.

905 Wester, R. E. & Cetas, R. C.
Thaxter, a new downy mildew-resistant lima bean.
Seed World 1959 : **84** : No. 12 : p. 2.

Developed by the US Department of Agriculture and the New York Agricultural Experiment

Station, Thaxter is suitable for canning and freezing and well adapted to mechanical harvesting. It is almost indistinguishable from Early Thorogreen and Clarks' Bush and outyielded both these varieties in many trials. This new variety was produced by crossing PI164155, a mildew resistant bean from Nagpur, India, with Early Thorogreen and back crossing to Early Thorogreen.

906 SEN, N. K. & VIDYABHUSHAN, R. V.
Chromosome complement of horse gram (*Dolichos biflorus* L.).
Sci. & Cult. 1959 : **24** : 523–24.

A 2*n* number of 20 is reported for three varieties of *D. biflorus*. Mitotic examination showed the chromosomes to be very small, ranging in length from 1·8 to 2·8 μ, and all having submedian primary constrictions. One short pair and one long pair could be readily distinguished. Meiosis was regular.

907 LARSON, N. G.
Soybeans, some botanical aspects. A selected list of references 1930-1958.
Libr. List US Dep. Agric. 1959 : No. 67 : Pp. 24.

General references and references on genetics, plant breeding, physiology and biochemistry are presented.

908 **Lindarin—a new soybean variety.**
Seed World 1958 : **83** : No. 12 : p. 25.

Additional information on the variety Lindarin is given [cf. XXIX, 3260]. It is resistant to frog-eye leaf spot (*Cercospora sojina*), has higher average yields and matures three days later than Blackhawk.

909 CRITTENDEN, H. W.
Pathogen-suscept relationship of *Meloidogyne incognita acrita* and *Glycine max*.
Diss. Abstr. 1959 : **19** : LC Card Mic 59–366 : p. 2219. (Abst.).

Obtained with a view to facilitating breeding for resistance, information is provided on differences between susceptible and resistant varieties in their histopathology and cytopathology after invasion by *M. incognita acrita*.

910 SCHILKE, P. J. & CRITTENDEN, H. W.
Host-parasite relationships of soybean and a rootknot nematode *Meloidogyne hapla*.
Phytopathology 1959 : **49** : p. 525. (Abst.).

The varieties Laredo, Anderson and Adams were exposed to *M. hapla* for different lengths of time. Galls appeared on Adams after 7 days and on Laredo and Anderson after 14 days. Adams had more larvae than Laredo or Anderson.

911 PČELAROV, V.
(Promising varieties of culinary peas obtained by open cross pollination).
Nauč. Trud. visš. selskostopan. Inst. G. Dimitrov (Sci. Trans. G. Dimitrov high. agric. Inst.) 1958 : **5** : 105–14 : from Ref. Bjull. bolg. naučn. Lit. (Ref. Bull. Bulg. sci. Lit.) 1959 : No. **1** : Abst. 67 : p. 42. [Bulgarian].

The progeny of a mother plant of a French variety showed great variability, attributed to pollination by other varieties. These plants served as initial material for selection of 300 and Sofia 135; both are canning varieties with better flavour than and superior technological properties to commonly grown Bulgarian cultivars.

912 MATEO BOX, J. M.
Cultivo y variedades de guisantes para obtención de grano seco. **(Cultivation and varieties of peas for producing dried peas).**
Agricultura, Madr. 1959 : **28** : 127–33.

An account is given of the types of pea cultivated in Spain, with descriptions of eleven of the main cultivars, grouped according to time of maturity.

913 MILOV, V. M.
(The effect of ecological conditions upon the protein content in pea seed).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 11 : 124–26. [Russian].

Studies of the protein contents of many pea forms belonging to different ecological and geographical groups at the Institute of Plant Industry have shown that the protein content depended on (1) intrinsic properties and (2) external conditions, in particular climate, soil, fertilizers and root-nodule bacteria.

914 VECSEY, T.
Termesztett borsófajtáink minőségvizsgálata. **(A study of quality in our cultivated pea varieties).**
Debrecen. mezőgazd. Akad. Tudomány. Évk. 1957 (1958) : 261–73.

Data on the contents of dry matter, vitamin C, protein, reducing sugars and total sugars are given for the seeds, pods and leaves of 13 marrowfat and 16 smooth-seeded varieties grown in Hungary. The green seeds of the former group contain nearly twice as much sugar as those of the latter. Content of reducing sugars in the leaves was greater in the smooth-seeded peas than in the marrowfats.

915 PČELAROV, V.
(Early culinary varieties of pea).
Selskostopan. Misǎl 1958 : No. 12 : 936–40. [Bulgarian].

Hybrids 85, 90, 103 and 126 were obtained by crossing the midseason Soviet cultivar Rannij Mozgovoj GK14 [Early Marrow-fat GK14] with Naj-ran [Earliest of All] at Sofia. They combine the earliness of the former parent with the desired characteristics of the other variety: high yield, high sugar content and reduced starch content.

916 QUANTZ, L.
Neues zur Virusresistenz bei Erbsen. **(New information on virus resistance in peas).**
Saatgutwirtschaft 1959 : **11** : 196–97.

Among 70 German varieties and breeding lines tested in the field over a number of years, 31 were resistant to leaf roll, 39 to pea mosaic and none to pea enation mosaic virus. A selection of foreign origin has shown 0–1·3% incidence of enation mosaic in 1957 and 1958, compared with 10–18% in the controls, and is to be used in breeding.

917 SINGH, D. & SHYAM, R.
Ovule sterility in gram, *Cicer arietinum.*
Curr. Sci. 1959 : **28** : 294–95.

Amongst F_3 progenies from the cross T87 x Bunchy mutant, certain plants set seeds in only 20% of their pods whereas the normal set was 90%. This ovule sterility was found to be a monogenic recessive character. All the sterile flowers had blue flowers instead of the normal pink ones; this was also a monogenic recessive character. Blue flower colour is not always associated with ovule sterility, for a blue-flowered mutant found at an earlier date did not have ovule sterility.

918 PATIL, J. A.
A mutation in *Cajanus cajan* (Linn) Millsp.
Poona agric. Coll. Mag. 1959 : **49** : p. 264.

A dwarf mutant differing in leaf and floral morphology from either parent has been obtained from *C. cajan* x *C. obcordifolia* at the College of Agriculture, Poona, and is undergoing genetical study.

919 JOGLEKAR, R. G. & DESHMUKH, N. Y.
Mutations in pigeonpea (*Cajanus cajan*).
Nagpur agric. Coll. Mag. 1958 : **32** : 23–29.

A mutant with simple leaves and another with ovate-oblong trifoliate leaves, respectively designated var. *unifoliata* and var. *oval-oblong trifoliata*, are described.

ECONOMIC LOWER PLANTS

920 GOL'DAT, S. JU. & ALIHANJAN, S. I.
(Influence of the combined action of ultraviolet and X rays on the mutation process in *Streptomyces aureofaciens* LS-B16).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **125** : 1134–36. [Russian].

Application of ultraviolet radiation immediately before X rays had a considerably lower lethal effect than would be expected by adding the effects of the two radiations used separately; the same was true when the X rays were applied after an interval of 1 or 2 hr. but after 3 hr. the lethality was increased. When the ultraviolet radiation followed the X rays the lethality diminished with greater intervals between the two radiations.

The mutation frequency was greater when the UV followed the X rays, the highest frequency, 14·2%, being obtained when the second irradiation took place immediately after the first.

921 ALIHANJAN, S. I., KLEPIKOVA, F. S., MINDLIN, S. Z., GARINA, K. P. & ŽDANOVA, N. I.
(The characteristics of the induced mutational process in *Actinomyces*—producers of antibiotics).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **125** : 643–45. [Russian].

The results of experiments on the induction of mutations in *Actinomyces* (*Streptomyces*) *olivaceus*, *A.* (*S.*) *globisporus*, *A.* (*S.*) *rimosus* and *A.* (*S.*) *subtropicus* by means of mutagenic agents such as ethyleneimine, γ rays, ultraviolet rays or X rays are presented in graphs. These show that (1) the frequency of $+$ and $-$ variants depends on the dose of the mutagen and that (2) a strain which has not been previously obtained by induced mutation gives an appreciably higher proportion of $+$ variants after treatment than strains that had been so obtained. The last phenomenon is explained by a "probable saturation" of $+$ strains with different kinds of physiological mutations. This situation is compared with the reduction in the frequency of mutations that may accompany an excess dose of a mutagen.

922 SERMONTI, G. & MORPURGO, G.
Action of manganous chloride on induced somatic segregation in *Penicillium chrysogenum* diploids.
Genetics 1959 : **44** : 437–47.

A detailed account is given of investigations which have already been briefly reported [XXIX, 1099].

923 **(The microbiologist and wine-maker, N. F. Saenko).**
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1959 : No. 3 : p. 60.

This biography of Saenko, written on the occasion of her 60th birthday, mentions her research on selection of yeast strains for fermenting different kinds of wine. The selections include 96K and 20S, which are highly tolerant of alcohol and ferment sherry types.

924 RIGONE DE PRITZ, M. J. A.
Contribución al estudio de las levaduras vínicas de la provincia de La Rioja. **(Contribution to the study of the wine yeasts of the province of La Rioja).**
Biol. téc. Fac. Cienc. agrar. Univ. Cuyo 1958 : No. 18 : Pp. 62.

Single-cell isolates made from 20 musts from different vineyards in La Rioja, Argentina, were found to belong to a number of different species of *Saccharomyces*, *Candida* and *Torulopsis*. In wine-making tests, four of these strains, all pertaining to *S. cerevisiae* var. *ellipsoideus*, were of high industrial quality, being tolerant of the quantities of SO_2 normally used and highly resistant to high temperatures; they also gave wines of very good quality.

925 GREVE, E.
Wirkung ionisierender Strahlen auf Hefezellen. **(The effect of ionizing rays on yeast cells).**
Z. Bot. 1959 : **47** : 435–61.

Recent research on this topic is reviewed, special attention being paid to the problem of distinguishing between direct and indirect effects, the dose response curve and the number of hits involved, target size, nuclear and plasmatic effects, and injury resulting from mutation.

926 OPPENOORTH, W. F. F.
Over biergist en Peking-eenden. **(On brewers' yeast and Peking ducks).**
23e Nacobrouw Jb. 1959 : 45–50.

In this popular article on the use of DNA as a transforming agent, it is noted that crosses between brewery top and bottom yeasts were effected with difficulty but showed that top fermentation was controlled by two factors. New combinations of characters were obtained more easily by means of DNA treatment than by crossing.

927 EMEIS, C. C. & GUTZ, H.
Eine einfache Technik zur Massenisolation von Hefesporen. **(A simple technique for the mass isolation of yeast spores).**
Z. Naturf. 1959 : **13b** : 647–50.

By homogenizing a sporulating culture, the asci may be disrupted and the ascospores separated from the debris and remaining nondisrupted cells by centrifuging. The spores may be cultured singly to give single-spore cultures or in clumps for studies of population genetics.

928 GUTZ, H. & EMEIS, C. C.
Saccharomyces als Objekt für populationsgenetische Versuche. **(*Saccharomyces* as material for studies of population genetics).**
Z. Naturf. 1959 : **14b** : 457–60.

An improvement in a previously described technique for the production of a sexually reproducing population suitable for genetical studies has been elaborated [cf. 927]. To obtain a panmictic population, the asci are broken down in an homogenizer, from which the ascospores, which have a lipophilic surface, may be separated by the addition of paraffin in which they become suspended; drops of the paraffin suspension may then be plated out and the resultant colonies mixed if required. For a selfed population, a sporulating culture is treated with alcohol to kill the vegetative cells; the unbroken asci are then plated out singly, so that only spores from a single ascus can mate. Some results of using the method in the study of genes for the utilization of histidine and uracil are briefly reported.

929 LASKOWSKI, W. & STEIN, W.
Mikroskopischer Vergleich der Zellvermehrung bei Hefestämmen verschiedenen Ploidiegrades nach UV- und Peroxyd-Inaktivierung. **(Microscopic comparison of cell multiplication in yeast strains of different degrees of ploidy after ultraviolet and peroxide inactivation).**
Z. Naturf. 1958 : **13b** : 305–14.

A haploid strain a–41 of *Saccharomyces cerevisiae* was more sensitive than its parental diploid strain 41 to inactivation both by ultraviolet irradiation and by organic peroxides; strain 20G of *Cryptococcus diffluens* was more resistant than either of the above two. In haploid strains the two treatments gave similar patterns of budding while in diploids there was budding with ultraviolet treatment but not with the organic peroxide.

930 TAKAHASHI, T. & IKEDA, Y.
Bisexual mating reaction in *Saccharomyces chevalieri*.
Genetics 1959 : **44** : 375–82.

Strain 9 of *S. chevalieri* from the Carlsberg Laboratory was investigated to see whether it had the concealed mating type found in *S. cerevisiae* [cf. XXIX 4682]; strain 9 is a homothallic diploid carrying the gene *D*. A single spore culture of this strain was found to be homozygous with regard to bisexuality; it mated with cells of both *a* and α strains of heterothallic haploids and with spores of concealed *aa* and αα strains of homothallic diploids; this strain of *S. chevalieri* is bisexual both in the ascospore state and in the vegetative state. All the diploid segregates obtained from hybrids between the strain carrying *D* and a Carbondale heterothallic strain were bisexual. It is concluded that *D* differs from the *HM* genes. Heterothallic haploid cultures were obtained from hybrids between two homothallic *Saccharomyces*; it is presumed that the haploid cultures carried either HM_1 or HM_2.

931 LINDEGREN, C. C., LINDEGREN, G. & DESBOROUGH, S.
Gene controlled resistance and sensitivity to caffeine and nicotine in Saccharomyces.
J. gen. Microbiol. 1959 : **20** : 504–09.

In a search for new genetic markers in *Saccharomyces*, the characters of reaction to caffeine and nicotine have each been found to be under the control of a single gene. The two new genes are situated on a chromosome carrying eight other markers.

BOOK REVIEWS

932 GURWITSCH, A. G. & GURWITSCH, L. D.
Die mitogenetische Strahlung. (**Mitogenetic radiation**).
Gustav Fischer Verlag, Jena 1959 : DM 27.65 : Pp. 308 : 50 figs. : tables.

The nature, and indeed the existence, of the so-called mitogenetic rays has long been the subject of controversy. The object of the book before us is to satisfy the reader by presenting a German translation of a monograph on the subject by the late A. G. and L. D. Gurwitsch [Gurvič]. Whether this object will be achieved seems rather doubtful, since the matter presented comprises not a description of some crucial experiments that dispel the last ray of doubt in a sceptical reader, so much as a long, largely theoretical discussion of the mode of action of the rays, much of the experimental evidence referred to being cited from literature already published. A description is given of the method of detecting the minute quantities of radiation that are emitted by various objects; it consists in counting the number of buds of a certain size in a yeast culture exposed for a given number of seconds to the source of radiation, compared with a control exposed to ordinary daylight. It is emphasized that the yeast cells in the culture must be in a suboptimum state of division for them to act as a suitable detector. A number of biochemical reactions, such as the action of phosphatase on nucleic acid and lecithin, are shown to emit a radiation which, in addition to stimulating cell division, causes certain detector materials, such as glucose, to fluoresce, though they themselves do not take part in the reaction. Various polycondensation processes, for example of aminoacids, may also occur. The mixture mostly used as a so-called "mitogenetic source" is $K_2Cr_2O_7$ with $FeSO_4$ in the presence of H_2SO_4, the radiation being in the range of 1900–3260 Å. In addition to cell divisions, peptide synthesis is also stimulated. Various agencies, such as cooling, narcotics and centrifuging, also cause certain tissues to emit radiations for brief spells. The effect is interpreted on the basis of an unbalanced molecular arrangement in the protoplasm maintained at the expense of some quantum source; the agencies in question increase the number of free radicals and the degree of peptization. Cells in which mitosis has been inhibited by cooling are stimulated to divide by irradiation and this effect is inhibited by a radiation-inhibitor such as furfurol. Cancerous cells emit radiation of unusual intensity and their radiation seems to be permanent, in contrast to normal cells, in which the radiation is said to be at a maximum just before mitosis.

933 Avery, A. G., Satina, S. & Rietsema, J.
Blakeslee: the genus Datura.
The Ronald Press Company, New York 1959 : $8.75 : Pp. xli + 289 : 67 figs. : 34 tables.

It would not be very much of an exaggeration to say the history of *Datura* is the history of cytogenetics, so many and varied are the problems that have been studied, and in great part solved, in this modest plant. And the name *Datura* is inevitably linked with that of A. F. Blakeslee. The results of the *Datura* work have been published in over 200 papers and the present volume presents a synthesis of them, written largely by A. G. Avery who cooperated in the work for 31 of the 40 years it was in progress.

After an introduction and a biographical sketch by E. W. Sinnott, and a bibliography of the *Datura* papers, we come to chapter 1, an historical review of the early research on genetics of *Datura* by the Blakeslee group and by other workers. Chapter 2 presents a review of the taxonomic history of *Datura*; this includes revised descriptions and illustrations of the main species; some of them are revised and certain observations are presented concerning specific relationships that have emerged from the genetical studies; thus *D. tatula* and *D. inermis* have been found to differ from *D. stramonium* in one and two genes respectively and are classed as members of *D. stramonium*. On the other hand the relationships of the *Brugmansia* group of species, and the question whether they should constitute a separate genus, are regarded as still unsolved.

Chapter 3, by E. Lette, is devoted to the alkaloids of *Datura*, information being given on their distribution in the different species. Chromosome number and morphology form the subject of chapter 4, by S. Satina; trisomics, monosomics, tetraploids, haploids, segmental interchange and ring formation were all discovered for the first time in *Datura* and the establishment of trisomics for each of the 12 chromosomes enabled a number of genetic characters to be identified with the effects of given chromosomes by Belling, who developed the iron-acetocarmine method for the purpose. Certain interchange types are characteristic of particular geographical areas, others have been found only in experimental material; some of the experimentally produced ones would easily have ranked as species had their origin not been known. In chapter 5, on polyploidy, we are reminded of the discovery of the value of colchicine for chromosome duplication in the course of this work on *Datura*; the first haploid is described, together with the homozygous diploids obtained from it. Triploids, tetraploids, hexaploids and octoploids have also been produced and are described. The extra chromosome types and various combinations of them are dealt with in the next chapter, which contains a passing reference to approximately two million *Datura* plants that have been grown to the adult stage in the course of these experiments. In chapter 7, on gene mutations, we are told that as a result of radiation and other treatments "*Datura* now displays a larger number of distinguishable types due to gene mutations than any other species of plants except corn (*Zea*)". Some 550 characters showing simple Mendelian relationships have been identified; of the many mutants obtained, only four have proved dominant. Mutants of special interest include one in which the green pigment was different from that in any known leaves, though it is related to chlorophyll *a*; a mutant exceptionally attractive to flea beetles; another almost indistinguishable from plants infected with the *quercina* virus; one carrying a gene that prevents the pairing of homologous chromosomes at meiosis; and another that causes twinning of the nuclei. Only one of the recessive genes has ever been observed to mutate back to its dominant allele, and this only occurred when the gene was in the heterozygous condition. Aging itself has not been found to increase mutation rate and apparently does so only in combination with unfavourable conditions of storage, chief of these being high temperature and humidity. The methods used in locating genes in a particular chromosome area are explained; genes for pollen abortion have been placed in almost every half-chromosome for this purpose, and 81 mutant genes have already been definitely located.

A large number of chimeras, mostly involving chromosome changes, have appeared, and form the subject of chapter 8 by S. Satina. Many of them have been obtained by colchicine treatment and the results show that more than one initial cell contributes to the growth of the shoot apex in this plant; the induction of polyploidy occurred most frequently in the innermost of the three layers. Studies of the development of the chimeras have led to some conclusions regarding the probable homology of certain organs, e.g. carpel and stamen primordia with shoot primordia.

Chapter 9 is devoted to the radiation experiments, which were begun in 1921, using radium emanation; X rays were first used in 1929 and no other agent has been found to be so satisfactory; no differences have been observed in the kinds of mutation obtained from X rays and from other agencies, though neutrons cause a greater number of effects than X or γ rays in equivalent doses.

Miss Satina gives an account, in chapter 10, of the development of the male and female gametophytes in the *Datura* species, referring to various genes that have been found to bring about anomalies in these processes. The division of the generative cell seems to be influenced by compatibility relationships towards the stylar tissue in interspecific crosses. Studies of fertilization and seed development, described in chapter 11, have confirmed the occurrence of double fertilization described first in *D. stramonium* by Guignard in 1902. The species differ in the rate at which the processes of seed development occur but in very little else. Seed abortion in incompatible crosses led to studies of growth processes in the embryo and seed and these form the subject of the next chapter, by J. Rietsema and B. Blondel, who give full details of the methods employed in embryo culture, by which hybrids of many otherwise unsuccessful crosses have been raised. Next comes a special chapter on segmental interchanges and the species problem, by S. Satina; many interchanges have been found in naturally occurring races of several species; some races when used in interspecific crosses differed in their behaviour. Ring formation and allied phenomena have made it possible to analyse the chromosome constitution of the species. It was found that common chromosome segments were present in almost all species and there were no individual chromosomes that were specific for a given species; nor is there any connexion between similarity of chromosome arrangements and compatibility; a case is even reported in which certain races of one species, *D. quercifolia* from Mexico, have chromosomes with similar end arrangements to certain races of another species, *D. stramonium* from Peru. Thus the conclusion is reached that the arrangement of the genes in the chromosomes is only one of many factors involved in the evolution of the species.

Barriers to fertilization and to crossability form the subject of chapters 14 and 15, by J. Rietsema and S. Satina, prefertilization and postfertilization barriers being considered; methods used in overcoming the barriers have been devised, largely by J. T. Buchholz,, and are described, together with a number of interesting hybrids, otherwise impossible to obtain, that have been procured with their aid. Marked differences in compatibility were observed in most reciprocal crosses; however, no complete explanation of seed deterioration and abortion can be offered, though the observations indicate that abortion is in some way associated with changes in the free aminoacids in the tissue.

A composite volume of this kind invariably leads to much repetition, as well as to a lack of uniformity in style of presentation and, in this particular instance at least, a certain inattention to grammatical considerations. Yet it provides an excellent illustration of the amount of light that can be shed on a complex problem when it is studied intensively from a number of diverse but coordinated angles, by a group of devoted investigators working with a single genus, as has been done by the Blakeslee group with *Datura*. As such it can be read with profit by anyone interested in the cytogenetics and evolution of almost any group of plants it is possible to name.

934 FISHER, R. A.
The genetical theory of natural selection.
Dover Publications, Inc., New York & Constable & Co., Ltd., London 1958 : 2nd Ed. : $1.85 : Pp. xiv + 291 : 11 figs. : 2 plates : 11 tables.

Perhaps the most remarkable feature of this second edition of a genetical classic is the relative infrequency with which the author has found it necessary to revise views which he first published as long ago as 1930. All substantial works on population genetics express their indebtedness to Sir Ronald's fundamental studies and the reappearance of the present volume in an inexpensive edition is most welcome.

The majority of the modifications are to be found in the first half of the book, in which the fundamentals of the author's theory of natural selection are developed; the applications to mankind are largely unaltered.

As one might suppose, echoes of some of the genetical controversies in which the author has engaged appear from time to time. Thus on p. 10 the evolutionary importance of genetic drift is discounted and, in an important additional section on self-sterility allelomorphs on pp. 104–110, the author again finds it necessary to dissociate himself from Wright's treatment of the problem. Allusion is now made on p. 9 to Sir Ronald's views on the relations between fact and theory in Mendel's pioneer work [cf. VII, 383].

The presentation of the fundamental theorem of natural selection is modified by treating the diploid population as one of N individuals rather than of $2N$ loci, and an extension is made to the case of multiple alleles. The chapter on this topic concludes with a critical note on biological properties supposed to benefit the species rather than the individual.

In the chapter on the evolution of dominance, the behaviour of the crinkled dwarf mutant of cotton is no longer taken as providing clear and simple evidence for the phenomenon under discussion, and the best evidence at present available for the evolution of dominance is thought to be that provided by Ford's work on the moth *Abraxas grossulariata*.

Another modification occurs in the mathematical treatment for the chance of survival of an individual gene on pp. 86–7. There are also two important additions to the chapter on sexual reproduction and sexual selection: on p. 145, an example of the role played by sexual preference in species fission, based on Field's study of butterflies in the genus *Limeritis*, is provided; and on pp. 153–54, a quantitative illustration is given of the author's interpretation of Darwin's theory of sexual selection.

The principal defect of the edition lies in the typography, the original text being reproduced by photo-offset and juxtaposed with the additional matter in a different fount.

935 BELL, P. R. (Editor).
Darwin's biological work.
Cambridge University Press 1959 : 40s. :
Pp. xiii + 342 : figs. : plates.

Darwin's ideas on evolution need no introduction to biologists, particularly in the centenary year. His contributions to experimental biology have however received less attention and it was partly to fill this gap that the editor decided on the publication of the present volume. The first chapter is by the editor himself and deals with the movement of plants in response to light; the coleoptile experiments, and related studies, leading finally to the discovery of plant growth substances, are shown to have developed from the rather primitive but perceptive experiments of Charles Darwin and his son Francis, and are recounted in some detail. This leads to a general account of subsequent investigations on auxins, all of which seems to take us a long way away from the original theme of the book, except in so far as it shows that in spite of the vast amount of research carried out during the century, the actual mechanism of phototropic response remains as much a mystery as it was when the Darwins performed their original experiments.

J. Challinor, writing on Palaeontology and evolution, finds that Darwin's chapters on the contribution of the geological record, and its defect, still provide the best review of the problem; he finds that "palaeontology confirms the theory of evolution, but that it does so, as it were, somewhat grudgingly". Many imperfections that remain in the record are pointed out; the majority of genera or families show no visible sign of orderly evolution in the successive fossils found and those showing a progressive series are still the exception. This is illustrated by an outline of the fossil types that are found in the successive strata in the British Isles, starting with the Lower Cambrian: there are still no authentic animal fossils from the Pre-cambrian. Even the coiling-up trend in the nautiloids has, we are told, been shown to be untenable; moreover, in some series, for instance the Graptoloidea, the earliest specimens are the most complex and the latest the simplest; the records of the reptile-birds, we are reminded, comprise only two or three specimens, and perhaps most woeful of all is the discovery that "the most famous of all, 'the gradual reduction of the side toes' in the horse is flatly fictitious". There is, however, a "sequence of rapid transitions". Thus the would-be evolutionist would perhaps be wise to confine his attention to plant fossils, which apparently fall more comfortably into the evolutionary picture.

In an essay on Natural selection, J. B. S. Haldane accepts evolution as an historical fact but discusses whether natural selection can account for it. A simplified exposition of genetical principles is presented, in which the opinion is expressed that "it has yet to be shown that the results obtained from such processes as grafting are likely to have been of any importance in evolution". "On the other hand, in bacteria a process very like Michurinism is normal". Mathematical formulae are presented showing how even minute differences of fitness of say one thousandth can alter the composition of a population in a relatively short time; cases are cited of human and other animal populations in which the effect of selection is to maintain a state of equilibrium on a mean value, others, such as that of the melanic moths, in which natural selection not only altered the phenotype but effected an accompanying biochemical change which improved its viability. Cases are also cited of the operation of sexual selection; alloploid species are mentioned as an exception to the

Darwinian principle of origin by natural selection. It is suggested that genetic assimilation may have provided a mechanism for the evolution of instinctive characters; other difficulties are also faced and the conclusion is that "the history of science makes it almost certain that facts will be discovered which show that the theory of natural selection is not fully adequate to account for evolution. But the same history makes it extremely improbable that these facts will be in any way related to the criticisms at present made of it". We presume that in the course of evolution the expression standard duration which appears on p. 123 will evolve towards some such term as standard deviation.

P. Marler writes on Developments in the study of animal communication, commenting on how little has been added to what Darwin had to say on the subject, most of which remains valid in the light of present knowledge. There has been a general confirmation of Darwin's conclusion that the faculty of articulate speech does not offer any insuperable objection to the belief that man has developed from some lower form. On the other hand, in Cross- and self fertilization in plants, H. L. K. Whitehouse points to a number of features in which Darwin's explanations have had to be modified, though much of the "mystery of life," before which Darwin "stood in awe" remains to this day; the contributions of Weismann, Mendel, Johannsen and others to an understanding of the principles of heredity are outlined. Cross fertilization and the Hardy-Weinberg law are invoked for preserving variability, mutation for increasing it; the nature and cause of mutation and of hybrid vigour nevertheless remain obscure. The various hypotheses that have been put forward to explain hybrid vigour are analysed. The genetic basis of self sterility is examined and the phenomenon referred to by Darwin as prepotency is held to be an aspect of it. Other phenomena such as heterostyly, diecism, gynodiecism and the various incompatibility mechanisms in lower plants are examined and shown to be devices favouring cross fertilization and hence hereditary variability.

In the last essay, Buffon, Lamarck and Darwin: the originality of Darwin's theory of evolution, J. S. Wilkie analyses the viewpoints of the three writers and finds that Buffon in his early writings, while accepting the principle of evolution, failed to appreciate the role of natural selection and he was throughout more concerned with classification than with evolution. Of the two basic tenets of Lamarck's system, that of linear advance is held to be the principal one and that of environmental influence the secondary; it was, moreover, not supported by any factual evidence; his theory had the further defects of being anthropocentric and deistic.

936 Heberer, G.
Die Evolution der Organismen. (**The evolution of organisms**).
Gustav Fischer Verlag, Stuttgart 1959 : 2nd Ed. : 6. Lieferung : DM 19.80 : Pp. iv + 1110–326 + xvi : figs. : tables.

The final instalment of this survey [cf. XXVII, p. 758] comprises three contributions, viz. Die subhumane Abstammungsgeschichte des Menschen [The subhuman evolutionary history of man], by G. Heberer, Die Genetik der Rassenbildung beim Menschen [The genetics of race formation in man], by O. Reche and W. Lehmann, and Stammesgeschichte des Seelischen (Paläopsychologie) [The phylogeny of the psyche (paleopsychology)], by E. v. Eickstedt. Professor Heberer sees the *Australanthropus* and *Paranthropus* groups as having branched off in the early Pliocene and become extinct in the early Pleistocene; the *Archanthropus* and *Palaeanthropus* groups suffered a similar fate in the late Pleistocene and only the *Pithicanthropus-Sinanthropus*, Neanderthal and *Sapiens* groups continued. The precise interrelationships of these three groups remain, however, obscure.

The second contribution lays stress on the similarities found beteen anthropoid apes and man in respect of their blood groups and protein structure and traces the steps by which the one may have given rise to the other and by which the various human races have probably evolved. No grounds are found for doubting the efficacy of selection as the agent of evolution or for any appeal to Lamarckistic or other interpretations. This last instalment contains author and subject indexes, title pages, preface and list of contents for the entire work.

937 Peckham, M. (Editor).
The origin of species by Charles Darwin. A variorum text.
Pennsylvania University Press, Philadelphia & Oxford University Press, London 1959 : 120s. : Pp. 816 : 6 tables : plates.

Of the 3878 sentences in the first edition of Darwin's *The origin of species*, nearly 3000, or some 75%, were, the editor of this edition informs us, rewritten from one to five times in the course of the next five editions; over 1500 were added and 325 dropped. A complete *variorum* text is hence undoubtedly called for. It is preceded by a detailed account of the events leading up to and immediately succeeding its publication, which embodies an outline of the main changes that Darwin made in the course of the six editions.

The complete text of the first edition is reproduced sentence by sentence, all variations detected in later editions being inserted for comparison immediately below the sentence in question. This method of presentation, naturally, does not make for ease of reading but it provides the most fascinating possibility of comparing the successive changes that Darwin made over the years and of thus gaining a certain insight into the working of his mind. Some were matters of detail, such as "missletoe", changed in the third edition to "mistletoe", "experimentised" happily changed to "experimented", *Mirabilis jalappa* to *jalapa* and so on; and there were notable improvements of the punctuation. Some of the changes consist of a process of polishing which robs the text of much of its spontaneous incisiveness: a difficulty which in the first edition "can hardly be considered real" has obviously been modified for Top People, for in the sixth it "should not be considered as subversive of the theory". The slave-making instinct is referred to in the first edition as "extraordinary and odious", in the sixth as "extraordinary"! Other changes testify to a distinct alteration in the author's viewpoint: thus concerning the causes of variability, the first edition states "something may be attributed to the direct action of the conditions of life"; the fifth edition adds "but how much we do not know." There are many similar instances, some of which bespeak greater confidence, some greater caution, some a swing between the two: thus we are told in the first edition that natural selection "will always act with extreme slowness"; in the fourth that it "always acts", in the fifth that it "acts" and in the sixth that it "generally acts"! Again, in chapter 5 the caution in referring to the possible inheritance of mutilations increases in successive editions.

Certain statements, such as those concerning monstrosities, varieties, the evolution of the eye and hybrid sterility, are altered in almost every edition and clearly caused much thought and even doubt, whereas others, for instance that concerning crossing, the importance of which "has been much exaggerated", remain virtually unchanged; so does the consoling remark at the end of chapter 3, that "the war of nature is not incessant, that no fear is felt, that death is generally prompt, and that the vigorous, the healthy, and the happy survive and multiply." Arguments which in the early editions appeared in modest form, such as the case of the primrose and the cowslip, are later replaced by more fully documented ones, in this case the oaks cited from A. de Candolle. Some are deleted, with a consequent loss to the picturesqueness of the narrative: who will not regret, for instance, the deletion in the second edition of the imaginary race of bears "rendered, by natural selection, more and more aquatic in their structure and habits, with larger and larger mouths, till a creature was produced as monstrous as a whale."

In chapter 3 we read of the Struggle for Existence and Natural Selection but only in the fifth edition do we find the addition "but the expression often used by Mr. Herbert Spencer of the Survival of the Fittest is more accurate, and is sometimes equally convenient." Several pieces are introduced in later editions to counter criticisms of the term natural selection and the theory of its operation, these amounting in the sixth edition to a whole new chapter. It is interesting to see that by that time much of the author's energy was taken up with defending not the principle of evolution itself but the efficacy of natural selection as its agent. There are substantial additions also in connexion with the degree to which organization tends to advance and many other topics.

It may be said that a book of this sort is totally unnecessary, since all self-respecting biologists have read the six successive editions of Darwin's work and are familiar with them. But have they? We are indebted to the editor for the painstaking way in which he has performed his task.

938 Bourne, G. H. & Danielli, J. F. (Editors).
International review of cytology. Volume VIII.
Academic Press, New York & London
1959 : $13.00 : Pp. 541 : figs. : tables.

As in the previous volume [cf. XXVIII, 4934], the emphasis is heavily on the side of animal cytology. Only one of the 13 contributions is concerned with a field of investigation in plant cytology: Wall organization in plant cells by R. D. Preston. This topic is important, not only for structural reasons, but because the microfibrils are "undoubtedly produced by enzyme complexes situated on or near the surface of the cytoplasm, and the detailed delineation of the products of reaction of these enzymes is one way, perhaps at present the only way, of defining these complexes." The paper deals mainly with investigations on the algae. Confined to animal cells, the other reviews in this volume represent, as in previous issues, a wide range of subjects, such as The structure of cytoplasm by C. Oberling, The cell structure of *Paramecium* by C. F. Ehret and E. L. Powers, A survey of metabolic studies on isolated mammalian nuclei by D. B. Roodyn and Osmotic properties of living cells by D. A. T. Dick. In Trace elements in cellular function by B. L. Vallee and F. L. Hoch, a fair amount of space is devoted to enzyme systems in yeast.

939 Palay, S. L. (Editor).
Frontiers of cytology.
Yale University Press, New Haven & Oxford University Press, London 1958 : 78s. : Pp. xii + 529 : figs. : 253 plates.

Based on a series of lectures at Yale University in 1955, the volume starts with a biographical note on Henry Bunting, to whom the volume is dedicated, in memory of his early death in 1954. The texts of the lectures were revised and brought up to date somewhat in 1957; works published in say 1952 are however still referred to as "recent" in many of the contributions and this is bound to detract from the value of the volume as a review of current work. One could also wish that phrases such as "important new developments are to be expected in this field" did not occur with such painful regularity throughout the volume.

The first few lectures refer to the contributions made by electron microscopy and other modern techniques to a knowledge of the structure of the cell surface and of the various cytoplasmic inclusions.

Chapter 4, by A. R. T. Denues, deals with Chromosomes: their constitution and function; the structure of the nuclear membrane and of the nucleolus, and the chemical composition of the nucleolus are examined and then the chromosomes themselves, the chemical composition of isolated chromosomes and the fine structure of giant chromosomes are considered; there follows a review of evidence for the role of chromosomes in both the genetic and the metabolic functioning of the cell; the bibliography appended to this chapter comprises 385 titles.

Chapter 5, by J. J. Biesele, is on Studies on mitosis in purine-treated tissue cultures; the mitoinhibitory effects of a number of compounds, alone and in combination, were tested on both healthy and neoplastic cells; chromosome aberrations of various kinds were produced by some of the treatments, their frequency being greater in cells of neoplastic tissue than in normal tissues: 6-chloropurine and 6-mercaptopurine seemed to be particularly effective in inducing stickiness and associated aberrations; their effectiveness was reduced in the presence of coenzyme A; the mutagenic action is considered to result from interference in the normal synthesis of DNA, RNA, proteins and possibly other substances constituting the chromosomes.

D. P. Bloch, in chapter 6, writes on Changes in the desoxyribonucleoprotein complex during the cell cycle; evidence for DNA constancy in normal tissues is adduced; cytophotometric determinations indicate that the replication of DNA occurs during interphase and lend support to a hypothesis of DNA synthesis along the lines of the Watson-Crick model. Alterations in the nucleoproteins during growth are looked upon as being possibly involved in the processes of differentiation and evidence pointing to the role of histone as a gene regulator is reviewed. The relationship between nuclear and cytoplasmic RNA remains to be established.

Pentosenucleic acids in relation to nuclear and cytoplasmic functions form the subject of the next chapter, by J. I. Nurnberger and M. W. Gordon; much is known as to their composition and structure but relatively little concerning function. Differences between nuclear and cytoplasmic PNA have been established but the concept of a structurally specific PNA associated with a structurally specific protein and the suggested template systems are, it is pointed out, still only speculations; it seems certain however that there is a close association between the localized synthesis of PNA and the processes of differentiation and morphogenesis and of protein synthesis. The author favours an hypothesis assuming that "high-energy phosphate compounds or their monophosphate precursors may exist in the cell in unstable equilibrium with the pentose polynucleotides of organized and structured cell components."

After chapters dealing with intracellular lipides and with protein histochemistry, we have a contribution by G. E. Palade on A small particulate component of the cytoplasm, the particles concerned being described as "the smallest among the newly discovered cytoplasmic components of the animal cell;" they measure 150 Å in diameter, are basophilic and are particularly frequent in the vicinity of the membrane of the endoplasmic reticulum; they consist almost exclusively of ribonucleoprotein. The morphology of secretion, cytology of striped muscle, differentiation in regenerating muscle, pathological swelling and vacuolization of cells, cellular reaction during virus infection, the interstitial ground substance as an element of natural resistance against infection and cancer, and collagen and reticulin form the subjects of the remaining chapters.

The volume is completed by an index and a collection of over 250 very beautiful photographic plates.

940 MELLORS, R. C. (Editor).
Analytical cytology.
McGraw-Hill Book Company, Inc., New York, Toronto, London 1959 : 2nd Ed. : £6 15s. 6d. : Pp. ix + 534 : figs. : tables.

The first chapter of the second edition of this advanced reference work [cf. XXVI, p. 528] is an entirely new one, contributed by the editor and dealing with the technique and applications of the fluorescent-antibody method. The second chapter, The intracellular localization of chemical constituents, by A. B. Novikoff, is also a new feature and presents "the integrative synthesis of biomorphology and biochemistry which constitutes a principal objective and a major achievement of analytical cytology." It is confined to animal tissues. Chapter 3, on Phase, interference and polarizing microscopy, by R. Barer, has been substantially revised. Chapter 4 on Electron microscopy: techniques and applications in cytology, by C. C. Selby, has been materially changed to keep abreast of the rapid advances in this field. Chapter 5, in which A. Engström deals with X-ray microscopy, has also been revised. Chapter 6, the contribution by P. J. Fitzgerald on autoradiography, has been little altered. In the seventh and last chapter, also revised, A. W. Pollister and L. Ornstein write on photometric chemical analysis.

941 READ, J.
Radiation biology of *Vicia faba* in relation to the general problem.
Blackwell Scientific Publications, Oxford 1959 : 45s. : Pp. xxii + 270 : 74 figs. : 41 tables : 6 plates.

The studies described in this volume were undertaken as part of an investigation of the effects of radiation on living tissues, with the ultimate object of gaining insight into its therapeutic use in treatment of cancer in human beings. The broad-bean root was chosen as experimental material because it was simple and "within the unaided capacity of two physicists untrained in biology." After accounts of the techniques used in growing the roots and irradiating them, the normal growth of the bean root is compared with that observed after various doses of irradiation. Doses of the order of 140 r. of X rays caused a certain amount of cell death but even 1440 r. did not stop growth entirely.

Slight but not significant differences between the rate of mitosis during the day and during the night were detected. One of the first effects of irradiation is a temporary reduction in the rate of mitosis. The efficiency in producing mitotic inhibition was 2·1 for fast neutrons compared with 1 for γ rays and 0·6 for α rays. This however bears no relationship to the efficiencies of these respective radiations in reducing the growth rate, which is the next observable effect. Another consists in the production of chromosome aberrations. After a description of the normal chromosomes of *V. faba*, some account is given of the aberrations found in irradiated material. The author's own observations are discussed together with the data published in the literature, which are cited at length. The efficiency of α rays, fast neutrons and X rays in producing aberrations was about the same. It is calculated that the chromosome breaks are distributed at random along the chromosome and that ends rejoin at random. The proportionality between breaks and dosage agrees with that encountered by Lea in *Tradescantia* and conforms fairly well with expectation based on the target theory. Certain deviations are interpreted according to a two-thread model for chromatid aberrations as proposed by Revell [XXVI, p. 510] and by the author himself [XXX, 101]. Fractionated doses showed no cooperative effect if the interval between the doses amounted to 8 hr. or more. The mean life of a chromosome break is calculated as about 2 hr.

Comparison of DNA synthesis as reported by a number of different authors shows it to follow a similar pattern in a wide range of cell types, including malignant cells; it seems to be completed about 8 hr. before mitosis; the maximum frequencies of chromatid aberrations and mitotic inhibition on the other hand occur just before mitosis and in its early stages respectively.

Figures published by a number of different authors are combined to show that the efficacy of any given radiation is proportional to its linear energy transfer, most radiations being more effective in the presence of oxygen; no truly satisfactory explanation for this effect is yet forthcoming, though there are indications that the oxygen exerts its influence in the early part of the chain of events resulting from ionization; the effect of oxygen is most pronounced with radiations with low energy transfer. HCN in the presence of oxygen increased the sensitivity to radiation and no protective action such as has been reported by certain investigators was observed. Radiosensitivity was not increased by high pressures of H_2 and O_2 but was increased by CO and reduced by inert gases.

Treatment with 8-ethoxycaffeine in the presence of O_2 produced aberrations similar to those from X rays but was without effect in the absence of oxygen. There was a direct correlation between the amount of growth reduction in the roots and the degree of mitotic aberration. The cells are shown to attain their highest sensitivity to X rays just before prophase; the same applies for 8-ethoxycaffeine, whereas nitrogen mustard, diepoxide and certain other mutagens exert their maximum effect in early interphase.

In a final summing up a number of analogies are drawn between the action of radiations on bean roots and on mammalian tissues. Radiomimetic chemicals on the other hand seem to be ineffective in mammalian cells.

942 RUDNICK, D. (Editor).
Cell, organism and milieu.
Ronald Press Co., New York 1959 : $8.00 : Pp. v + 326 : figs. : tables.

A symposium was held on the subject of Differentiation in response to the biochemical environment on 9–11 June 1958 at Mount Holyoke College, South Hadley, Mass. As can be seen from the present volume, the papers presented covered a wide field of interest. The first was by C. E. Wilde on Differentiation in response to the biochemical environment; differentiation is defined as "any reasonably permanent change in the chemistry and morphology of an embryonic cell which makes it distinctly different from its precursor state," though the expression "distinctly different" is not defined. Evidence is given of differential behaviour in cells that on all morphological criteria appear identical. The response of cells to physical contact, vitamin A, phenylalanine and a number of its derivatives, urea and aminoguanidine is analysed in an attempt to show that specificity of action at the molecular level is the basis of morphogenesis. Some experiments are described in which cells of mouse and chick embryos were disaggregated and mixed together in a nutrient medium; after a few days, not only had aggregates of uninucleate cells of random order as to source been formed, but there had been actual fusion of cytoplasms so that nuclei of mouse and chick were contained in a common cytoplasm!

In The role of cell structures in cell movements, H. Hoffmann-Berling shows that many cell movements arise through active changes in protein structure, a number of quite different mechanisms, of which the muscle mechanism is but one, being demonstrated.

There follow contributions on the enzymatic role of tocopherol in muscle tissue, the regulation of the myometrium, the adaptation of phosphatases in development, and insect growth hormones. We then come to two dealing with plants; the first of these is Experimental modification of development in the root, by J. G. Torrey, who shows that the central zone of the root meristem is metabolically inert but is responsible for the control of the vascular pattern formed by the meristem and evidently contains the genetic coding; it exerts its control apparently through auxin action. A technique is described whereby single cells can be isolated from a callus on *Pisum sativum* roots and grown in hanging drops of a culture medium containing 2,4-D and yeast extract; after culture for 2½ years the cells had varying chromosome numbers, diploid ($2n = 14$), tetraploid, octoploid and $12n$ cells being present in addition to a number of aneuploids, especially round the tetraploid number; various forms of aberrant mitosis were observed. Details are given of the origin of this polyploid condition on the basis of periodic counts during the period of culture; the condition described at the end of 2½ years was reached after about 3 weeks of culture. A similar condition was observed in 1-mm. root tips cultured in the same medium. In a synthetic medium without yeast extract all the cells became diploid. On transferring the clone established in liquid culture to normal pea-root medium, lacking in both yeast extract and 2,4-D, root formation occurred, the cells of the root tissue being all diploid. However, after prolonged culture in the liquid medium the clone lost its capacity to form roots; this is thought to result from the elimination of all diploid cells in the culture. The maintenance of the diploid condition seems to require a correct balance of substances of the auxin type, limiting DNA synthesis, and the kinetin type, limiting cytocinesis.

In Fruit growth in relation to internal and external chemical stimuli, L. C. Luckwill reported some experiments showing how the auxin content of many fruits varies during the course of development. Synthetic auxins used for inducing fruit set, increasing fruit size, reducing fruit drop and thinning fruit are referred to, though their mode of action still remains to be elucidated.

The last two contributions are on control of growth and differentiation by carbon dioxide tension and on the physiology and biochemistry of the mammalian blastocyst.

943 Troll, W.
Allgemeine Botanik. (**General botany**).
Ferdinand Enke Verlag, Stuttgart 1959 : 3rd Ed. : DM 77 : Pp. xvi+ 927 : 699 figs.

The third edition of Professor Troll's work follows the general lines of the first [cf. XIX, p. 923]. The quality of the paper is much improved and though the chapter headings mostly remain the same, a certain number of modifications have been introduced in the text. Thus the section on symmetry has been extended, in the chapter on cytology the terminology of nucleic acids and other compounds has been modernized, polyploidy is explained and mitochondria are described as well as plastids. Chapters dealing with physiology have been simiarly expanded and accounts of the reproductive processes in the fungi have been introduced. A number of illustrations have been added and the number of pages has increased from 749 to 927.

944 Luck, J. M. (Editor).
Annual review of biochemistry. Volume 28.
Annual Reviews, Inc., Palo Alto, California 1959 : $7.50 : Pp. vii + 698 : figs. : tables.

Plant geneticists will again find much to interest them in the 28th volume [cf. XXIX, 3307]. It starts with a prefatory chapter on Fifty-five years of union between biochemistry and physiology, by E. F. Terroine, who injects much wisdom into a series of reminiscences. There follow chapters on chemistry of carbohydrates, the lipides, chemistry of aminoacids and peptides, and the structure of proteins. In Protein synthesis, J. L. Simkin shows that aminoacids, and not peptides, are used for this process, though the exact mechanism of their activation remains somewhat uncertain; it appears that soluble ribonucleic acid must have a certain terminal nucleotide sequence before it can act as an aminoacid acceptor, but specificity for given aminoacids seems to reside elsewhere in the molecule. Corroborative evidence that the microsomes are a site of protein synthesis is reported though doubt is expressed as to whether they are the sole site. Evidence in support of the role of RNA in protein synthesis is cited, though again ignorance still prevails as to its exact mechanism; but many hypotheses have been put forward and are examined.

After chapters on the metabolism of carbohydrates, aminoacids and steroids, on the biochemistry of carcinogenesis and on clinical biochemistry, we come to The biochemistry of genetic factors by J. R. S. Fincham; the work reviewed points to DNA molecules as one of the operative principles, though probably not the only one, in the transfer of genetic information, since this role is apparently taken on by RNA in some plant viruses. The ingenious code proposed by Crick is mentioned, together with suggestions by certain other authors that "the base sequence of RNA may be determined by DNA through each RNA base corresponding to one of the four possible pairs of bases (adenine-thymine, thymine-adenine, cytosine-guanine, guanine-cytosine) of the DNA double helix." A list is given of cases that confirm to the one gene - one enzyme hypothesis and many other simple biochemical differences are shown to result from changes at a single locus, either chromosomal or cytoplasmic; there is even evidence that mutations affecting the same protein tend to be located within the same chromosomal region; the findings of Hartman and others that the gene order often reflects the order of the biochemical steps involved is referred to [cf. XXIX, 999], though exceptions are also mentioned and the data on enzyme complementation in a heterocaryon are taken as arguing against the direct synthesis of enzyme by a chromosomal locus.

S. C. Hartman and J. M. Buchanan give an extensive review of Nucleic acids, purines, pyrimidines (nucleotide synthesis), citing a bibliography of no less than 308 references. New evidence is adduced indicating that nucleoside triphosphates may be direct precursors of nucleic acid nucleotides, that the nucleus is the site of RNA synthesis, and that nuclear RNA differs in composition and physical properties from cytoplasmic (microsomal) RNA; other forms also appear to exist. Results reviewed suggest that in several bacteria the synthesis of both constitutive proteins and adaptive enzymes is dependent upon the synthesis of RNA and not upon the RNA content of the cells; exceptions are cited however even to this principle. Recently introduced methods of isolation have led to the identification of several new components of nucleic acids.

Two chapters deal with water-soluble vitamins and others are devoted to nutrition, mineral metabolism, oxygenases and hydroxylases, metabolism of connective tissue, neurochemistry and, finally, biochemistry in the USSR.

945 JUCKER, E. (Editor).
Fortschritte der Arzneimittelforschung. (**Progress in drug research**).
Birkhäuser Verlag, Basel and Stuttgart 1959 : **1** : sFr. 68 : Pp. 607 : figs. : tables.

The growing volume and specialization of scientific literature makes it ever more difficult to obtain an overall view of progress in any given field and the solution that seems to enjoy most popularity at present is the review series comprising survey articles with complete and up-to-date bibliographies. The volume under review ushers in yet another such series, devoted to drug research. Owing to the wide interest in the subject it should appeal to general readers and specialists in many biological fields beyond the medical sphere to which it is principally directed. This applies to at least one of the surveys in the first issue, namely Stereochemical factors in biological activity, by A. H. Beckett. The majority of chemical substances formed and broken down by enzymes are optically active and it has been suggested that almost all enzymes are effective because of a complementary structure of the reacting molecules. The principles of optical and geometrical isomerism and of molecular conformation are elucidated and some typical effects produced by isomeric differences in biologically active compounds are cited, with suggested explanations of their action; various enzymes, narcotics and plant growth hormones are included in the substances considered. Nature, we are told, carries out her reactions on a three-dimensional basis and attention to this must be given in any attempt to reduce the empiricism involved in the preparation of agents with a desired biological effect.

The other reviews in the volume have a more purely medical bias.

946 HAGEMANN, W.
Vergleichende morphologische, anatomische und entwicklungs-geschichtliche Studien an *Cyclamen persicum* Mill. sowie einigen weiteren *Cyclamen*-Arten. (**Comparative morphological, anatomical and ontogenetic studies on *C. persicum* Mill. and some other *Cyclamen* species**).
Gustav Fischer Verlag, Jena 1959 : Bot. Stud. No. 9 : DM 11.50 : Pp. 88 : 57 figs.

The genus *Cyclamen* has long held out attractions to those who would interpret its pecularities in the light of conventional morphological categories. Yet, in spite of much study, many details of the morphology and development of its best-known representative, *C. persicum*, have remained uncertain. The present study presents the results of a painstaking investigation of the external morphology of the vegetative organs of this species, the branching system, the anatomy of the growing points, the vascular system, the development and differentiation of the embryo, the structure of the corm and the anatomy of the roots. The results are interpreted in the light of the fastidiously refined morphological categories of the Mainz school of morphologists led by Prof. Troll. Among the less recondite findings is the confirmation that *C. persicum* has only one cotyledon. The corm is regarded as comprising both hypocotyl and the first internode of the epicotyl; in anatomical structure it corresponds to a primary root.

947 TAYLOR, G. (Editor).
Index Kewensis plantarum phanerogamarum. (**The Kew index of phanerogamous plants**).
Oxford University Press 1959 : Suppl. 12 : 75s. : Pp. 157.

The twelfth supplement to this most indispensable of taxonomic works lists species of angiosperms and gymnosperms published in the interval 1951–55, as well as the inevitable bag of ancient epithets that had managed to elude earlier issues.

As the editor remarks in his preamble, the number of species published in the interval shows some decline over earlier issues and it is suggested that this may be due both to the extent to which the world has been explored botanically and to increasing circumspection by botanists before publishing new species. These points are of considerable interest and it would be useful to know (1) whether the over-all rate of discovery of new flowering plants is now declining and at what rate, and (2) whether the rate of coining or rediscovering new epithets is suffering a similar decline.

It is clear, from a cursory survey of this and the preceding supplements, that the situation varies considerably from genus to genus. Taking a typical large genus of world-wide distribution such as *Hypericum*, which is of little economic importance and has suffered neither the special attentions of a monographer nor a splitter, the numbers of species published in the successive supplements are (55), 26, 34, 53, 29, 16, 51, 33, 29, 32, (26), 14, the figures in brackets representing 10-year periods and the others 5-year periods. The figures show a rise to a maximum during 1906–25, with a dip during the 1914–18 war and a general decline thereafter. This appears to be the standard pattern for many genera but it is liable to be violently upset by monographic intervention. For example, the corresponding figures for the tropical genus *Oncostemum* are (6), 0, 42, 0, 0, 0, 0, 0, 0, (0), 50, where the two explosions are respectively due to the monographic activities of Mez and Perrier. It is clear that some genera—one hopes that they are principally confined to the tropics—have not yet entered into asymptotic decline.

The editor's remark on the increasing discretion of taxonomists is consoling and one would like to attribute it to genetical influence. However it raises the wider problem of how best to cope with the epithets already enshrined in the *Index*. While the noting of new epithets will always remain a necessary task, it seems likely that, in the future, it will become of secondary importance to deciding the taxonomic, as contrasted with nomenclatural, status of the epithets already published. It would be presumptuous to suggest how this could be done but one feels that any attempt to tidy up a taxonomic mess is worthy of at least as much notice as the creation of a new one.

948 Roemer, T. & Scheffer, F.
Lehrbuch des Ackerbaues. (**Textbook of field husbandry**).
Verlag Paul Parey, Berlin and Hamburg 1959 : 5th Ed. : DM 59 : Pp. viii + 555 : 98 figs. : 157 tables.

The principles set out in this textbook are applicable to the conditions of agriculture obtaining in central Europe, with its temperate climate. The central theme of the book is the soil and its fertility. The various factors that influence this are analysed in turn and there are also comprehensive chapters on climate, crop rotation, manuring, irrigation, seeds, weeds and weed control; the section on seeds contains remarks also on vegetatively reproduced planting material. The methods of producing seed of high quality and purity are outlined, various criteria of quality are analysed and attention is drawn to the importance of choice of variety and the contribution made to varietal improvement by plant breeders in the last 70 years. The various grades of pedigree seeds and the criteria used in seed certification are defined; the importance of provenance is emphasized and a brief account is given of the results of some of the recent provenance tests with various field crops. Seed dressing and time of sowing are also discussed briefly.

949 Timakov, V. D. (Editor).
Microbial variation.
Pergamon Press, London 1959 : 40s. : Pp. x + 202 : figs. : tables.

The work referred to in this volume has all been carried out at the Gamaleia Institute of Epidemiology and Microbiology in Moscow. It is presented in the form of a series of articles, rendered into a very adequate English version by G. H. Beale the translator: the heavy prosaic nature of the text is clearly not the translator's fault, since each of the essays says, in almost identical words, roughly the same things about an almost identical experiment, the only difference being in the organism undergoing treatment. The whole is said in the preface to provide "experimental confirmation of the basic tenets of Michurin biology".

In an introductory chapter, V. D. Timakov defines the species in pathogenic microorganisms in the following words: "a group of phylogenetically related organisms, resembling each other in morphological and biological characters and possessing an hereditary ability to bring about qualitatively defined specific processes in the natural medium". He considers the cases described in the later chapters of the book and concludes that they constitute not so much the transformation of one species into another as the formation of new species of microorganisms. The next three chapters, by V. D. Timakov and N. S. Semcheva, deal with Directed variation of enteric bacteria. *Escherichia coli* when grown on an aerated medium with heat-killed cells of *Salmonella breslau* as the sole source of nitrogen produced, after varying numbers of subcultures, strains lacking the ability to ferment lactose, some of them showing the serological characteristics of *S. breslau*; the changed properties persisted sometimes for over two years. The rate at which the changes were brought about varied with the strain of *S. breslau* used; in the presence of horse serum the changes occurred more slowly or not at all. When *E. coli* was grown in the presence of killed cells of *S. paratyphi*, variants occurred which had lost the ability to curdle litmus milk and to split lactose, and possessed the serological and pathological characteristics of *S. paratyphi*. In the presence of dead cells of *S. typhi*, strains with the characteristics of *S. typhi* occurred but only after a much greater number of subcultures. On *Shigella paradysenteriae*, variants incapable of fermenting lactose in liquid media, curdling milk and fermenting mannitol arose, some of them possessing the serological properties of *Sh. paradysenteriae*. Conversely, *S. typhi*, *S. paratyphi* and *Sh. paradysenteriae* grown in the presence of dead cells of *E. coli* gained various biochemical, pathological and serological properties characteristic of the strain of *E. coli* used.

A further series of chapters under the same title by D. G. Kudlai follows. Firstly, various strains of *E. coli* were grown in the presence of dead cells of *S. breslau*, more elaborate precautions to check the sterility of the dead culture being described than in the preceding set of experiments. A range of variants was obtained, some showing varying degrees of change towards the properties of *S. breslau* and some having new combinations of properties such as forms which do not ferment maltose but are agglutinated by anti-*breslau* serum, and alkali-forming forms which showed strong resemblances to naturally occurring fecal alkali-producers, isolated from carriers or chronic dysentery patients; the resemblances are analysed in a later chapter by K. I. Tulukov. When *S. typhi* was used, strains differed in their power to produce variants; the variants included strains agglutinated by antisera, from *S. typhi*, *E. coli* and the alkali-producers respectively; other variants had enzymatic and serological properties similar to those of the directing strain and others produced alkali. Treatment of *E. coli* with nucleoprotein derived from *S. paratyphi* gave rise to variants, some of which were agglutinated with anti-*paratyphi* serum and had a certain immunizing capacity against paratyphoid when inoculated into mice; yeast nucleoprotein had no comparable effect. From *E. coli* grown with heat-treated *Sh. paradysenteriae*, variants resembling the latter in both serological and pathological properties, described by G. R. Gadzhieva, showed close similarities with aberrant strains isolated from dysentery patients.

G. R. Gadzhieva also describes changes in *E. coli* occurring after injection into rabbits previously immunized by injection with heat-killed cultures of *Sh. paradysenteriae*; variants that were agglutinated by anti-*paradysenteriae* serum were produced, some of them having lost the capacity to ferment lactose. Growth in rabbits immunized by *Proteus morgani* also produced *E. coli* variants serologically allied to *P. morgani*, some of them lacking the capacity to ferment all sugars but glucose; these variants also resembled strains that have been isolated from carriers and chronic patients.

Experimental transformation of the small-pox virus into the vaccinia virus is described by M. A. Morozov and M. I. Korol'kova as an instance of species conversion in the Mičurin sense; selection is being carried out on the converted material with the object of obtaining strains with valuable practical properties such as heat resistance, tolerance of drying and high viability.

O. S. Emel'ianova describes attenuated strains of the tularemia bacterium produced by culture on a special agar medium which can be used in the preparation of living vaccines; the origin of these strains is ascribed to the response of the organism to abnormal conditions of reproduction; the avirulent strains are not however considered to be distinct species.

Directed variation in tubercle bacilli forms the subject of the next series of chapters, by A. I Togunova and colleagues. The virulent bovine strain of *Mycobacterium tuberculosis* when cultured with "antibiotic D" or with streptomycin gave rise to strains with diminished virulence, some of which retained their immunizing capacity and may thus be useful in preparing vaccines. The effects of injecting the nonvirulent strains into guinea pigs are described in some detail.

Variation in *S. typhi* after treatment with chloromycetin is described by V. G. Petrovskaia; marked increases in resistance to chloromycetin were observed, without any concomitant increase in streptomycin resistance; some of them were less liable to be lysed by phage, and other differences were also observed; some of them were more, some less virulent and certain avirulent strains with almost unreduced antigenicity were isolated. Differences were observed between the initial strains in the rate at which they acquired resistance and also lost it when acquired; no case was found however in which the resistance was fixed. Under the influence of streptomycin, variants of *S. typhi* resistant to this antibiotic were obtained; they were unchanged in biochemical and antigenic properties but some were reduced in virulence; this change was moreover stable.

Growth of staphylococci on media containing antibiotics, described by N. N. Artemova, led to the isolation of strains resistant to streptomycin; resistance to penicillin was acquired less rapidly and to gramicidin C less rapidly still; the strains resistant to streptomycin and gramicidin C retained their resistance more successfully than those resistant to penicillin. All resistant strains were reduced in virulence. The effect of various antibiotics on *Sh. paradysenteriae* is described by Z. G. Pershina; resistance was acquired with some antibiotics more readily than with others. R. V. Gordina refers to the origin of phage-resistant forms of *S. paratyphi* B after injection into mice in the presence of phage Vi; some of them showed changed biochemical properties but most did not; they were reduced in agglutination capacity by Vi-antisera but were more strongly agglutinated by O-antisera. Bacteria grown in the presence of O phage remained unchanged in agglutinating capacity or were slightly more sensitive to Vi-antisera; no change in resistance or other properties was observed. Most of the resistant strains were reduced in virulence. Similar experiments with *S. typhi* are described by Z. S. Ostrovskaia. Finally, E. N. Levina showed the existence of biochemical differences between strains of *E. coli* that inhibit and those that stimulate the growth of dysentery bacilli.

950 BURNET, F. M. & STANLEY, W. M.
The viruses : biochemical, biological, and biophysical properties. Volume 2.
Academic Press, New York 1959 : $13.00 : Pp. xvi + 408 : figs. : tables.

Except for subjects of the most restricted specialization, monographs in the old and comfortable form are apparently a thing of the past. Their place has been taken by the composite volume consisting of a series of essays on different aspects of the subject, each contributed by a specialist. Indeed, to cover the science of viruses, which were only discovered some 60 years ago, three such volumes are required. Volume 2, devoted to plant and bacterial viruses, opens with a contribution by S. G. Wildman on The process of infection and virus synthesis with tobacco mosaic virus and other plant viruses. Descriptions of the entry of the virus into the leaf of a susceptible plant show the process of attachment to a susceptible site to be complex and instantaneous. Virus strains vary by as much as six times in their sensitivity to inactivation by ultraviolet radiation. The differences between strains disappear when the infection is performed with the nucleic acid constituent, rather than the intact virus, and the course of virus reproduction is accelerated; nucleic acid is thus regarded as the infective principle.

R. Markham, in The biochemistry of plant viruses, gives an extensive review of present knowledge about the composition of those plant viruses that have been studied at all adequately. More attention is, we are told, now being given to the protein constituent; an outline is given of what is known of its constitution, followed by similar information on the nucleic acids. The individual viruses are then treated in turn, starting naturally with tobacco mosaic virus; the accounts are historical and admirably illustrated. Among the points of interest that emerge is the fact that since the infective properties reside in the nucleic acid of the virus, preparations of sap that had been "sterilized" with 40% formaldehyde solutions were found to be infective after two years had elapsed! Assertions to the effect that the composition of the virus protein is independent of the host are found to be insufficiently well founded. One of the most cogent statements occurs towards the end of the review, namely that "it is impossible to be absolutely certain about anything concerning viruses at the present time." One thing however seems fairly certain, and that is that most of the substances so far tried as antiviral agents have proved either ineffective or more toxic than the virus itself.

Variation and its chemical correlates are reviewed by C. A. Knight, who finds that few, if any, plant viruses do not mutate and points out some of the ways in which the variants differ from the parent strain; and the ways in which they may be isolated. The various criteria of strain relationship are defined, their respective limitations being pointed out. Over 400 strains of the tobacco mosaic virus have been reported and figures are given showing that some of these strains differ in the aminoacid composition of their protein whereas others do not; closely related strains on the whole showed less differences. No such differences could be detected between strains of the tomato bushy stunt virus. It is pointed out that when differences exist they may involve any one of the various aminoacids, only cysteine, leucine and proline being exceptions up to now. No significant structural differences between strains have so far been demonstrated and it is assumed that each variant strain of a group of viruses will have the same number of subunits, which will be indicated by the presence of equal numbers of terminal aminoacid residues. These terminal residues will not only be equal in number but also in kind. No differences have yet been detected between strains of the same virus in respect of the content of RNA or of its composition, though recent results indicate differences in the sequence of the nucleotides within the nucleic acid in three strains of tobacco mosaic virus. Various modifications in the composition of the viral protein and nucleic acid have been effected without any change in infectivity or the symptoms and no mutations have so far been produced by irradiation of virus; mutants obtained by treatment with nitrous acid are however mentioned [cf. XXIX, 1206].

L. M. Black writes on Biological cycles of plant viruses in insect vectors and A. Lwoff on Bacteriophage as a model of host-virus relationship. It is supposed that the genetic material of the prophage and that of the bacteria have a common origin in the genetic material of a primitive bacterium, the phages having evolved by the loss of a number of features characteristic of organisms; they also differ from organelles and hence are classed as viruses, several definitions of which are proposed.

The initiation of bacteriophage infection is described by A. Garen and L. M. Kozloff, who consider the process of injection of the genetic material of the host into the bacterial cell, particularly in the T phage of *Escherichia coli.* All phages so far examined have been shown to possess tails, to contain protein and DNA without, it seems, any RNA. The attachment is by the fibres at the distal end of the tail but killing and lysis are brought about apparently by enzymes located in the tail sheath. Ghost phages devoid of DNA can kill and bacterial walls devoid of contents can bind certain phages, though the cell membrane devoid of the wall cannot. The various steps that follow reversible attachment and culminate in the injection of the phage DNA into the host cell are outlined and the different factors known to affect them are examined; these all seem to be connected with their effect on the bonds in the tail proteins. It has been possible to obtain resistant cell mutants with almost all the phage-host systems studied, some mutants involving resistance to several phages; resistance generally involves failure of attachment and hence modifications of the cell surface; surface antigens seem to be involved. It is usually also possible to select phage mutants that can then attach to the resistant cell and crosses between different phage mutants have led to the conclusion that a certain region of the phage chromosome determines a specific configuration at the tip of the tail, and that the attachment specificity is under the control of a highly complex pattern of genetic factors. The existence of phenotypically hybrid particles shows moreover that more than one kind of attachment site can be present in a single particle. The changes occurring during the process of invasion are described and beautifully illustrated. The exact mechanism of the injection of DNA is still not known but seems to involve the triggering action of the tail enzyme, which contains free aminoacids.

G. S. Stent gives, in Intracellular multiplication of bacterial viruses, a useful historical account of knowledge accumulated on this subject since the pioneer work of d'Hérelle in 1915. It has now been shown that the synthesis of phage DNA begins 6–7 minutes after infection; it apparently exists, together with phage protein, for some time in a so-called mating pool before the two are put together to form mature phage particles; tracer experiments have shown that a large part of the host DNA is also broken down and reconstituted as phage DNA. On the other hand very little of the phage protein is derived from that of the bacterial cell. The occurrence of phenotypic mixing is taken to indicate random association of materials from the phage DNA and phage protein precursor pools. The existence of these pools, as witnessed by the eclipse phase during the life cycle of the phage, is stated to be one of the attributes of viruses which most readily distinguish them from other obligate intracellular parasites. A certain amount of evidence is cited in support of the view that the DNA molecules of the parent phage do not act directly as templates for replica DNA molecules but transfer their hereditary information to some other type of macromolecules such as ribonucleoprotein.

After what has gone before, the reader may be a little astonished to come now to a chapter on Bacteriophage genetics, by C. Levinthal, who does not share the view of those who "see in some of the current problems and apparent contradictions, the prospect of a breakdown of most of the currently fashionable ideas and, possibly, even a new and fundamental complementarity or uncertainty principle in biology." The study of multiple matings has shown that the mating event which forms recombinants in phage is not identical with the process of crossing over in higher organisms, and the notion of the vegetative pool is once more expounded. A model for phage genetics is proposed which involves only simple modifications of the self-complementary scheme of duplication of Watson and Crick. It is described as follows: "From the overall point of view this model results in the interaction of two DNA structures which together produce one new particle which has a heterozygous region at the point at which the copying changes from one of the parental structures to the other; in this region negative interference can occur in that at least one of the two chains can show several switches. In this scheme it would be assumed that particles can also duplicate without mating, that is, one particle could make two as well as two making three. The model also makes some rather specific predictions as well as accounting for currently available data. For example, it suggests that whenever negative interference occurs, that is, whenever there are several switches in the same small region, the total number of switches must always be odd; the mating which produced the particle of negative interference will produce a heterozygous particle". It is conceded however that much further study from both the chemical and physical side is necessary.

Chapter IX, by F. Jacob and E. L. Wollman, is on Lysogeny; it is shown that in lysogenic systems the capacity for the induction of phage is present in some strains and not in others, this capacity being in most cases, though apparently not in all, a property of the prophage and not the host. The precise mechanism of induction of phage from prophage is not understood but seems to involve a disturbance of the nucleic acid economy of the host. The various properties conferred on the bacterial cell by the presence of lysogenic phage are analysed; some of them involve alterations in the metabolic activities of the bacterial cell comparable to those conferred by its own gene system. Various mutants of temperate phages are described; they can be induced by irradiation of the phage or of the bacterial cell before it is infected. Experiments on bacterial recombination have demonstrated that lysogeny is under the control of a nuclear determinant which is the prophage itself and is located at a specific site on the bacterial chromosome: any lysogenic bacterium usually carries only one prophage of a given type but may carry several unrelated prophages; the location of 14 different prophages has been established in *E. coli*. The prophage appears to consist of DNA but, unlike vegetative phage, is incapable of producing protein; the evidence so far indicates that it is added to, not substituted for, a homologous segment of the host chromosome; this presumably accounts for its capacity to transduce a fragment of genetic material from a donor to a recipient host. It is suggested that corresponding proviruses will probably be found to exist in the viruses of higher plants and animals.

The last chapter is on Radiobiology of bacteriophage, by F. W. Stahl, who confines his review mainly to the effects of ultraviolet radiation, though brief sections are also devoted to the action of P^{32} and X rays. The results discussed are accepted as showing that inactivation by radiation of T-even bacteriophage is primarily a result of discrete lesions produced in the genetic structure of the particle. The biological function of a hit region is inactivated whilst the unhit regions retain their functions. Thus when an injected cell contains at least one complete unhit set of genes, recombination between particles occurs and the undamaged genome is reconstituted; this can occur within the cell after the formation of new vegetative phage particles 6 minutes after infection and is therefore taken to account for the sudden fall in sensitivity after 6 minutes.

951 Kappert, H. & Rudorf, W. (Editors).
Handbuch der Pflanzenzüchtung. (**Manual of plant breeding**).
Paul Parey, Berlin & Hamburg 1959 : 2nd. Ed. : Lief. 30 : Vol. 4 : Bogen 21–25 : 321–400; Lief. 31 : Vol. 6 : Bogen 1–5 : 1–80; Lief. 32 : Vol. 4 : Bogen 26–30 : 401–80; Lief. 33 : Vol. 4 : Bogen 31–35 : 481–552 : figs. : tables : DM 13.50 each.

Instalment 30 [cf. XXIX, 3317] continues the section on *Trifolium* in volume 4, with Inkarnatklee, *Trifolium incarnatum* L. [Crimson clover *T. incarnatum*] by W. Hertsch. The interrelationships of the varieties are considered, the cultivated forms being thought to have descended from var. *molinarii*, which, the reviewer states rather mysteriously, occurs wild in Spain "up to the Asturian coastal areas in Algeria". Published data on chromosome number and cross and self fertility are reviewed; little or no inbreeding depression is observed after selfing. The author's own observations on tetraploid strains show them to be late in spring growth and hence low in seed yield; they exceed the diploids however in standing capacity. Übrige *Trifolium*-Arten [Other *Trifolium* species] are dealt with by G. Julén, who reviews the literature devoted to breeding *T. hybridum* *T. alexandrinum* and *T. subterraneum*. W. Hertsch, under the title Serradella, *Ornithopus sativus* Brot. [Serradella, *O. sativus* Brot.], reviews published data on *O. sativus* and *O. compressus*; forms from the southern Atlantic region are higher in yield but later than northern forms; one cultivar, Ostsaat [Eastern Seed], combining these two qualities, is referred to. Tetraploids are 33% higher than the diploids in yield of green matter and though their seed yield is low at first it improves in later generations. Esparsette, *Onobrychis viciifolia* Scop. (syn. *O. sativa* s.l. Lam.) [Sainfoin, *O. viciifolia* Scop. (syn. *O. sativa* s.l. Lam.)] is also treated by W. Hertsch, who distinguishes three subspecies, *arenaria*, *montana* and *sativa*, all presumed to have the chromosome number $2n = 28$. The wild forms from the eastern Mediterranean area and Asia are considered promising for breeding purposes, particularly in respect of winter hardiness and drought resistance. In Hornklee, *Lotus*-Arten [Birdsfoot trefoil, *Lotus* species], W. Hertsch deals with *L. corniculatus*, of which he distinguishes three subspecies, *eucorniculatus*, *tenuifolius* and *uliginosus*; though the first is a tetraploid, with $2n = 24$, it is not regarded as an autopolyploid of the second; the subspecies *eucorniculatus* and *uliginosus* are considered the most suitable for breeding purposes; several cultivars of the former but only one of the latter are named.

The remainder of instalment 30 is devoted to Die Gräser [The grasses]. The introductory, general chapter, by J. G. Knoll and G. Baur, has been revised by W. Hertsch; it outlines the taxonomic relationships of the species, their floral biology, cytology and interfertility relationships; various breeding methods are outlined and we then pass to a succession of chapters on the separate species. The first is Knaulgras, *Dactylis glomerata* L. [Cocksfoot, *D. glomerata* L.], by W. Hertsch. Taxonomic, cytological, compatibility and genetic information and the main results of breeding are reviewed, the existing cultivars being named and described. The instalment ends with the first part of *Poa pratensis, trivialis, palustris, compressa* und verwandte Arten [*P. pratensis, trivialis, palustris, compressa* and related species], by E. Åkerberg and A. Nygren.

Instalment 31 begins volume 6, on breeding in horticulture, viticulture and forestry. The first contribution is in the section entitled Wurzel-, Rüben- und Knollengemüse [Root and tuber vegetables], and is entitled Möhre, *Daucus carota* L. [Carrot, *D. carota* L.], by O. Banga. Taxonomy, origin, developmental physiology, floral biology and crossing technique are reviewed and there follows a series of sections on yield, earliness, quality and breeding methods. The fact that male sterility has been found in several cultivars is taken as auguring well for the production of hybrid varieties. G. Becker writes on Rettich und Radies (*Raphanus sativus* L.) [Radish (*R. sativus* L.)]; systematics and origin are discussed, the most probable origin being considered to be by selection from *R. maritimus* in the eastern Mediterranean area. Cytology, floral biology, self sterility and distant crosses are next considered and the inheritance of the main economic characters is reviewed, together with various techniques for estimating them; the main diseases are mentioned and the methods employed in breeding radishes are described. The last page of this instalment gives us the beginning of Speiserübe [Table beet], by O. Banga.

Instalment 32 completes the section on *Poa* in volume 4, with reviews of information on variation in chromosome number, intraspecific, interspecific and intergeneric crossing, mutations, and the results of breeding, with a table of existing cultivars. Brief sections are then devoted to the three other species. T. J. Jenkin then writes on Fescue species (*Festuca* L.); systematics, geographical distribution, cytology, interspecific crossing, floral biology and the techniques of hybridization and of breeding are reviewed, with a final section on the results of breeding. The ryegrasses (*Lolium* L.) are also dealt with by T. J. Jenkin on similar lines. There comes then a section on *Bromus*- und *Ceratochloa*-Arten [Species of *Bromus* and *Ceratochloa*] by W. Hertsch, who discusses the economic possibilities of a number of species, their taxonomy, cytology, floral biology and compatibility relationships and mentions a few cultivars of *B. inermis* and *C. marginata*. A similar treatment is adopted by W. Hertsch for *Avena*-Arten [*Avena* species], the species dealt with being *Arrhenatherum elatius* and *Trisetum flavescens*, for *Agrostis*-Arten [*Agrostis* species], for *Phalaris*-Arten [*Phalaris* species], which are continued in instalment 33, and for *Alopecurus*-Arten [*Alopecurus* species]. G. Julén writes on Wiesenlieschgras, *Phleum pratense* [Timothy, *Ph. pratense*] and W. M. Myers on The wheatgrasses, *Agropyron* spp. The next section of volume 4 is *Brassica* leaf- and stem forage-plants, by K. J. Frandsen, the forms dealt with being leaf kale, thousand-headed kale and marrow-stem kale. This completes volume 4 and the instalment is provided with subject index, title pages, lists of contents and prefaces to the first and second editions.

952 BÄRNER, J.
Bibliographie der Pflanzenschutzliteratur 1952. (**Bibliography of plant protection, 1952**).
Biologische Bundesanstalt für Land- und Forstwirtschaft, Berlin-Dahlem 1959 : Pp. 433.

This bibliography, covering papers published in 1952, is arranged along similar lines to the preceding numbers in this series [cf. XXVIII, 4942].

953 Grist, D. H.
Rice.
Longmans, Green & Co. Ltd., London 1959 : 3rd Ed. : 48s. : Pp. xxiii + 466 : 38 figs. : 29 tables : 68 plates.

With the third edition [cf. XXIV, p. 143 and XXV, p. 638], the text has undergone substantial revision, three new chapters have been added, the chapters have been more conveniently rearranged in three parts and various new appendices have been compiled. The outstanding defect in the earlier editions, namely, absence of chapters on the breeding and genetics of the crop, has been admirably remedied in the first part, which covers botanical and other aspects of rice as a plant. One of the new chapters, contributed by D. Rhind, deals with the genetics of characters of agricultural value, and another, based largely on an unpublished account prepared by this collaborator, is devoted to improvement by selection and breeding. In both, the information is given very clearly. The second section, concerned with different aspects of paddy production, includes the third new chapter, Weeds, in which methods of chemical control are given due prominence. The third part consists of the revised chapters on storage, milling, nutritional value and economic topics. The appendix on The scope and work of the International Rice Commission has been retained. Among the new appendices are one on Standardization of rice terminology and another giving specimen field and laboratory record cards used in selection. The entries in the bibliography now number 569, as against 305 in the second edition.

954 Cosmo, I., Comuzzi, A. & Polsinelli, M.
Portinnesti della vite. **(Vine rootstocks).**
Edizioni Agricole, Bologna 1958 : L. it. 2.000 : Pp. xi + 172 : 72 figs. : 5 tables.

In this useful booklet the authors start with a succinct outline of the situation that developed in European viticulture after the appearance of *Phylloxera vastatrix* in 1868. The defects of the various American species introduced as resistant to *Ph. vastatrix*, *Uncinula necator* or *Plasmopara viticola* are indicated and it is pointed out that even today those hybrids which most closely approximate to the European vine in quality tend to be inferior in resistance. Viticulturists who wish to produce fruit of high quality must still therefore have recourse to grafting. A brief account is given of the systematics of the genus *Vitis* and descriptions are presented of the main species that have been used either as rootstocks or as parents in producing hybrid rootstocks. The species are treated in the order of their importance in this respect, the first being *V. riparia*; then follow *V. rupestris*, *V. berlandieri*, *V. cordifolia*, *V. candicans* and *V. longii* (syn. *V. solonia*). A number of synonyms and corruptions by which many of the species have been designated are also indicated.

The various organs of the plant and the observations that can be made on them in preparing varietal descriptions are described and the international scheme adopted for this purpose is reproduced. There follows a series of descriptions, compiled according to this scheme, of all the rootstocks that have at any time been used at all extensively in Italian viticulture, each description being accompanied by a photographic illustration. A key is then provided to aid in identifying the rootstocks, first by placing them in their respective groups. In chapter 5 some indications are given of the points that should be looked for in a good rootstock; the merits and defects of the stocks in most common use in Italian viticulture are examined and those displaying the most satisfactory resistance to drought, lime, excessive humidity or soil salinity are listed. Finally recommendations are given of the best rootstocks to employ for different conditions. Thus for heavy noncalcareous soils Rip.-Cord.-Rup. 106.8 is recommended; for good loams, even if slightly calcareous, Kober 5BB and 225 Ruggeri; for moist soils, whether slightly calcareous or not, 1103 Paulsen or Cosmo 10, the former being suitable also for saline soils; for soils subject to occasional drought, 775 Paulsen or Cosmo 2; for light dry soils, 420A (Berlandieri x Riparia); for heavy dry soils and highly calcareous soils, 140 Ruggeri; for rocky, arid soils 779 Paulsen; finally, for very sandy soils, no rootstock is required and the European vines can be grown on their own roots.

955 Pangalo, K. I.
(Melons).
Gosudarstvennoe Izdatel'stvo Moldavii, Kišinev 1958 : 5 r. 85 k. : Pp. 297 : 24 figs. : 55 tables : plates. [Russian].

This small volume, dedicated to the late N. I. Vavilov, begins with a chapter on the origin of the melons and of their cultivation. This is thought to have taken place in Asia Minor and

Central Asia. There follows a series of chapters devoted to cultivation of melons, their botanical features, and the main diseases and pests. Part 2 of the book deals first with taxonomy. On the basis of studies of a large collection comprising over 4000 forms the author proposes to reinstate the genus *Melo*, of which 15 species are described, arranged in 4 sections. The melons of the Near East, Asia Minor and Europe are classed in the section *Eumelon*, in which there are two series, *graciles* and *rigidi*, with *M. microcarpus* standing apart; ser. *graciles* comprises the melons of Asia Minor and Europe, viz. *M. adzhur*, *M. cassaba*, *M. adana*, *M. cantalupa* and *M. ambiguus*; in species where a number of forms or cultivars exist, those showing resemblances are grouped together in a nidus. The series *rigidi* comprises melons of Central Asia, Iran and Afghanistan, viz. *M. chandalak*, *M. ameri*, *M. zard* and *M. flexuosus*. The melons of eastern Asia are classed in section *Melonoides*, with *M. chinensis*, *M. conomon* and *M. monoclinus*, and the weed and forage melons in section *Bubalion*. Very little is known about the Indian melons, which are placed in section *Archimelon*; they combine features associated with both section *Melonoides* and section *Eumelon* and probably represent a relic of the prototypes from which the other sections have evolved; some even combine the characters of melon and water melon [cf. XV, 773].

After a chapter on biochemistry we come to chapter X dealing with breeding work, particularly that carried out in the USSR. In the Soviet republics of Central Asia a wide range of local varieties of very high quality exists but they are very susceptible to *Fusarium*, *Verticillium* and other fungous diseases. In the North Caucasus, the Ukraine and Moldavia these same melons, having been allowed to reproduce by open pollination without any selection, have become more resistant but have largely lost their quality. By selection from these local populations, and from the world collection of the Institute of Plant Industry improved varieties have been produced for a number of localities, including some areas where melons had not previously been grown. The methods of selection are described and some of the varieties that have proved most successful in transmitting certain desirable qualities such as yield, flavour, time of ripening or disease resistance to their hybrids are mentioned; many of the most useful pollen parents belong to *M. zard*.

In breeding for increased yield it is important that this should be attained by increasing the weight and number of fruits rather than mere size; hybrids bearing a large number of fruits per plant have been obtained from crosses with *M. microcarpus*; the variety Gul'sor, from *M. chandalak* x *M. zard*, bears 8–12 large fruits per plant compared with 3–4 in the parents, and crosses with *M. agrestis* are also considered promising in this respect. The early-ripening melons, such as *M. chandalak* and *M. adana*, are poor in quality and have been crossed with *M. cassaba*, *M. ameri* and *M. zard*; the hybrid Gul'sor ripens only 5 days after *M. chandalak* 'Sorokodnevka' [Forty-day melon], and other early hybrids of good quality are under observation; one of these, Novinka [Novelty], is a hybrid of *M. adana* x *M. chandalak* 'Sorokodnevka'. A certain scepticism is expressed concerning the efficacy of the more complex techniques employed by some research stations in the Soviet Union, involving a combination of grafting on pumpkins, pollination with mixed pollen and training by sowing out of doors, in breeding early-ripening melons.

Observations made in European Russia on 150 winter melons belonging to *M. zard* collected in Central Asia showed them to be unsuitable for cultivation but several hybrids produced by crossing them with European melons mature fruits which can be stored until the middle or end of December; F_1 hybrids can be produced economically by hand pollination and promising results have been obtained recently with α-naphthylacetic acid and certain other chemicals inducing male sterility. Certain hybrid combinations produce progeny which remain fairly constant even in later generations.

Bush melons have been produced in crosses with two bush forms, *M. chandalak* 'Tahmi' and *M. cantalupa* 'Beš' [Bush?] and a hybrid from the former has already been released.

Chapter XI defines and illustrates the characters employed in varietal differentiation and in XII, descriptions are given of the main cultivars of melon grown in the Soviet Union, some of them being illustrated in colour; they comprise representatives of the species *M. cantalupa*, *M. adana*, *M. cassaba*, *M. chandalak*, *M. ameri*, *M. zard* and various intermediate and hybrid types.

The final chapter provides a classified bibliography.

NEW JOURNAL

Biologia Plantarum.

This journal, which first appeared in 1959, is published by the Czechoslovak Academy of

Science, the primary aim being to make known the work of Czechoslovak scientists. Original papers on plant physiology, experimental ecology, genetics, cytology, experimental morphology, biochemistry and pathology will be published in any of the better-known languages. The second number of the journal includes an article in Russian on the use of γ-hexachlorcyclohexane as an agent for inducing polyploidy. The journal will appear four times a year and the yearly subscription is Kčs 30. Further information may be obtained from Biologický ústav ČSAV, Na cvičišti 2, Praha 6.

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